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RD&A

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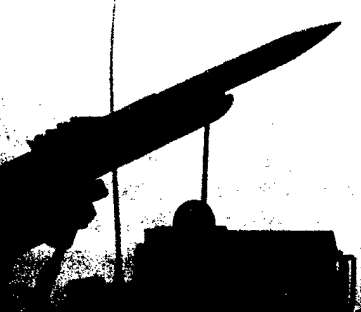

Developing Technologies For The 21st Century

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Research Development Acquisition ARMY RD&A

Professional Publication of the RD&A Community

FEATURES

DEPARTMENTS

COVER

Shown on the front cover is the High Mobility Multi-purpose Wheeled Vehicle mounted Advanced Medium Range Air-to-Air Missile, one of the technologies being developed at the U.S. Army Missile Command's Research, Development and Engineering Center.

THE U.S. ARMY MISSILE COMMAND'S RESEARCH, DEVELOPMENT AND ENGINEERING CENTER

Leading America's Army Into The 21st Century

By Pam Rogers

Author's Note: *As a result of Base Realignment and Closure 95, the U.S. Army Missile Command (MICOM) at Redstone Arsenal, AL, and the U.S. Army Aviation and Troop Command in St. Louis, MO, will merge in October of this year and become the Aviation and Missile Command (AMCOM). The following article addresses the capabilities and mission of MICOM's Research, Development and Engineering Center.*

Introduction

Ever since men first came out of their caves and fought each other with sticks, the quest has been for bigger sticks, sharper sticks and sticks that would reach farther than the enemy's. Back then, warriors sought to dominate the battlefield, to fight on their own terms, and to achieve crushing victory. Things haven't changed all that much. Today's military commander still seeks to shape the battlefield, to make it his battle, not the other guy's, and to have the weapons it takes to win.

Ensuring that 21st century military leaders have the technology and the weaponry to fight the battles of the future and win is the job of MICOM's Research, Development and Engineering Center (MRDEC). Working to project and sustain the force, dominate the maneuver battle, conduct precision strikes and win the information war, the MRDEC's vision is to "Enable the 21st Century Soldier to Achieve Swift Decisive Victory Without Casualties."

Survivability First

The last two words of the MRDEC vision are the most important to the MRDEC Director, Dr. William C. McCorkle, who believes the primary application of today's and future technology should be to protect the most important asset the Army has—soldiers. McCorkle likes to bring the Loss Exchange Ratio into more human terms by posing the question, "What is the acceptable number of casualties?"

"None is the most acceptable number...we must insure survivability. That's the most important. Survivability first, then decimate the enemy," he asserts. "That is not just because we have empathy for the soldiers who must go in harm's way. The hard truth is that for a force projection Army, limited in the number of soldiers we can project in a short time, we must be capable of achieving a high favorable loss exchange ratio against a numerically superior adversary, or we will lose, period."

To that end, he must provide his primary customers, program executive officers and project managers, with the most up-to-date

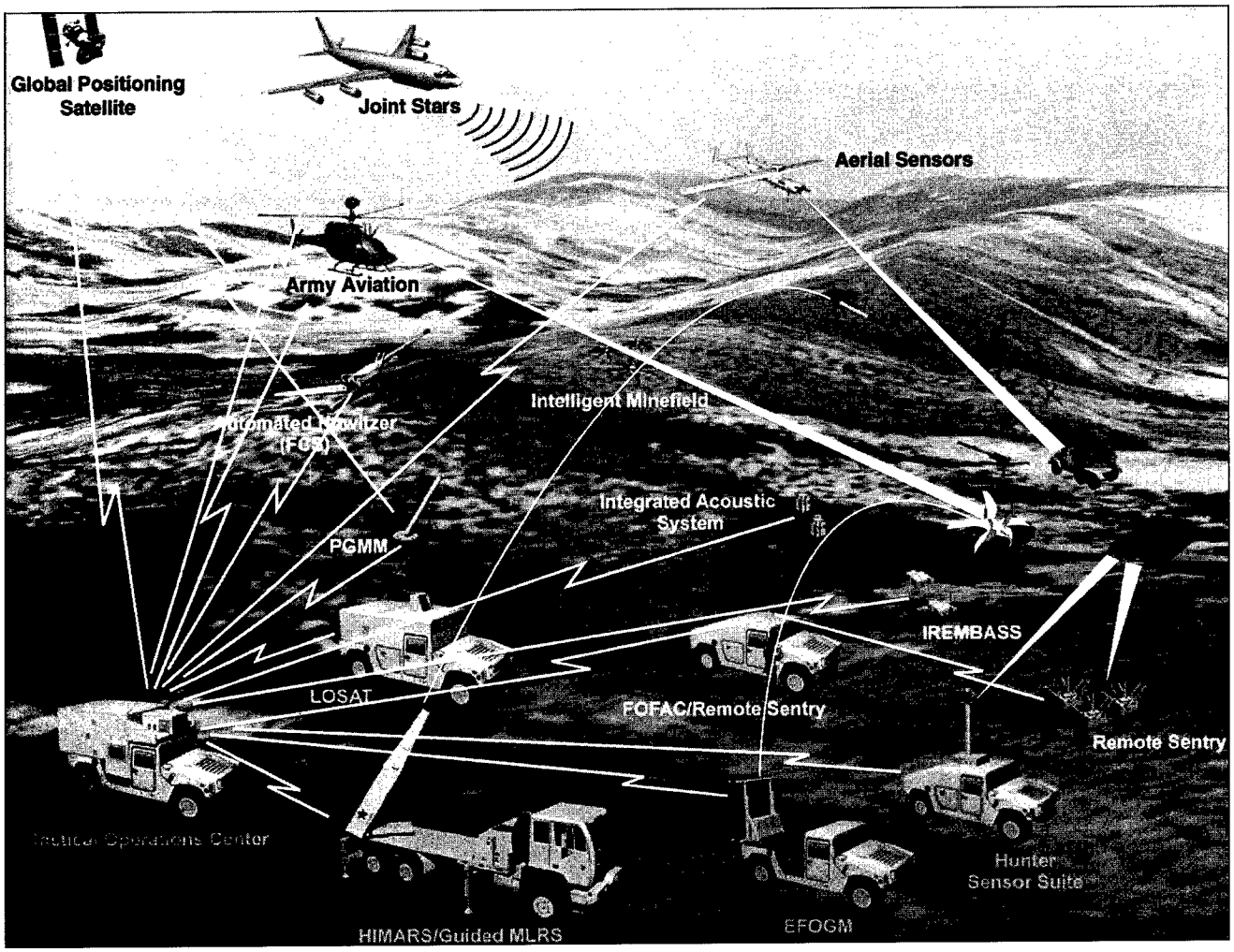

Figure 1.
Rapid Force Projection Initiative.

technology, applied in the most cost-effective fashion. With a decentralized threat and a CONUS-based, rather than forward deployed troop base, a means of rapid deployment becomes more important than ever. Fortunately, the MRDEC is working on just such a concept.

RFPI Technology Demonstrations

The MRDEC's Rapid Force Projection Initiative (RFPI) Advanced Concept Technology Demonstration (ACTD) is aimed at developing the means for an early entry force to move quickly to defeat an overmatching armor force. Major building blocks of the concept include the use of remotely-piloted and ground reconnaissance vehicles and advanced sensors ("hunters") that will be used in conjunction with long-range weapons employing smart munitions, remotely-guided weapons and highly mobile systems ("standoff killers"). They will be directed by fully digital battlefield command, control and communication. The RFPI will employ lightweight systems that will be fully C-130 transportable. (See Figure 1.) Such forces eventually will be inserted within hours instead of the weeks and months it takes for more conventional deployments.

"A classic story is Desert Storm" says McCorkle. "It took us six months to build up. The lesson learned by the world was don't give the U.S. six months to build up."

As an ACTD, RFPI is being developed with the full support and participation of the user. Although the RDEC has traditionally coordinated its technology programs with the user through the Advanced Systems Concept Office and the Science and Technology Objective process, the ACTD construct has allowed a more formal and intensive working relationship, in which the Battle Lab at Fort Benning co-manages the ACTD. Numerous technology demonstrations with the user have already taken place, a large-scale field demonstration will take place at Fort Benning in 1998, and RFPI hardware will be left with the 18th Airborne Corps for two years for further testing and evaluation.

MRDEC Programs

Although budgetary constraints continue to make the development of completely new weapon systems much less frequent, weapons still become obsolete and soldiers still deserve the best technology has to offer. The MRDEC has consistently combined cost-saving approaches with advanced technology and thoughtful employee development practices to come up with solutions.

Some of the programs the MRDEC is pursuing are described below:

(Continued on page 5)

INTERVIEW WITH DR. WILLIAM C. McCORKLE

U.S. Army Missile Command Technical Director And Director, MICOM's Research, Development And Engineering Center

As the U.S.Army Missile Command (MICOM) Technical Director, Dr. William C. McCorkle serves as the senior technical advisor to the MICOM Commander on all research and developmental matters. As Director of the MICOM's Research, Development and Engineering Center (RDEC), he is responsible for providing major research, development, production, field engineering, software engineering, and product assurance support to more than 25 project and product managed systems. In addition, Dr. McCorkle is responsible for planning and executing the Missile Command's programs in research, exploratory and advanced development of missiles and high energy lasers.

Dr. McCorkle promotes the advancement of many areas of technology and their applications. His management style is collegial, fostering an environment where new ideas and information exchange are encouraged. He promotes a team approach in which employees of various areas within the RDEC work together toward common objectives. He does not micro-manage, but rather delegates to his managers the authority commensurate with the responsibility to perform the tasks at hand. Providing this "responsibility with authority" environment ensures a knowledgeable, well-qualified team fully capable of handling the difficulties encountered on an effort. When problems arise, he does not seek to place blame, but instead focuses on finding solutions, providing the stability of a supportive management.

Dr. McCorkle came to MICOM in 1957 from a position at Tulane University and has since served in a number of increasingly responsible scientific and engineering positions, including an 18-month rotational assignment in the Department of Army Staff as Science Advisor to the Director of Weapons Systems. He has worked on missile-related research and development problems and projects associated with virtually every missile and rocket system under MICOM cognizance. He has achieved national recognition for initiating and guiding the center's highly successful pioneering work in fiber optic guidance links for missiles, providing a revolutionary countermeasure-resistant capability for finding and engaging both rotary wing and armored targets out of the gunner's line of sight.

He has long and effectively championed the use of simulation techniques for missile design and analysis and initiated the effort which led to MICOM's Advanced Simulation Center, a major national facility and key to a number of successful missile development and improvement programs.

Q. What do you believe should be the highest priority in developing technology for the 21st century?

A. I think the biggest change is in moving from a forward-based Army, against a known threat to a force projection Army against uncertainty. Forward-based forces are heavy forces. We need to develop the technology to match the rapid force projection paradigm. That seems to be the future challenge. This means focusing on the light forces—weapons for the 18th Airborne Corps, for example. I see this as the principal opportunity for new systems and technology. We're trying to work on technologies that would allow us to greatly lighten the forces while enhancing lethality, survivability and deployability.

Q. What improvements might you offer for enhancing the Army's current acquisition process?

A. I endorse the acquisition streamlining that's being worked now. We are going to performance-based specifications rather than the old specs and standards, but we're not through seeing all the consequences of this new direction. The law of unintended consequences is going to have an impact. An example is that this approach will seem to favor the prime contractor, with fewer opportunities for small businesses. The prime contractors that put components together that are manufactured by smaller businesses need to form partnerships and alliances that will preserve business opportunities.

Q. What impact is the DOD downsizing effort having on your mission?

A. We must remember we have been downsizing for a long time. We outsource 75 percent of science and technology activities. A primary impact has been the elimination of duplication in science and technology. We work much more closely now with other government agencies and are continuing the emphasis on reliance activities which means closer coordination and cooperation in the "division of labor" in science and technology. A major impact is the combining of missile and aviation technology through the creation of the Aviation and Missile Command at Redstone Arsenal that will become effective in October. This is a great opportunity for synergism. Now we will have a marvelous platform for many of our systems. We expect to work closely with our aviation counterparts, especially in developing systems for light forces. The 101st Air Assault Division of the 18th Corps is a heavy user of rotary wing aircraft. I see this as a great opportunity to enhance rapid force projection efforts we have under way, and I'm confident that the merged command will have a major impact on this Army's future.

Q. What impact do you expect the Army Acquisition Corps to have on your near- and long-term goals?

A. The original focus of the Army Acquisition Corps was not intended to have a large impact on the science and technology activities. I think it was designed to have a larger impact on procurement activities, which is part of acquisition. The reason for having science and technology activities is really to ensure the Services are smart buyers and users of advanced technology, and this continues to define our role in the acquisition process.

Q. What advice would you offer to an individual considering a career in the science and technology area?

A. By all means every individual should consider it. If it matches a person's interests and capabilities, I don't think there is a more interesting and absorbing field. The emphasis on science and technology in the 21st century will continue to be vitally important to our national interests in defense and commerce and the preservation of our quality of life. Information technology is at the center of all science and technology.

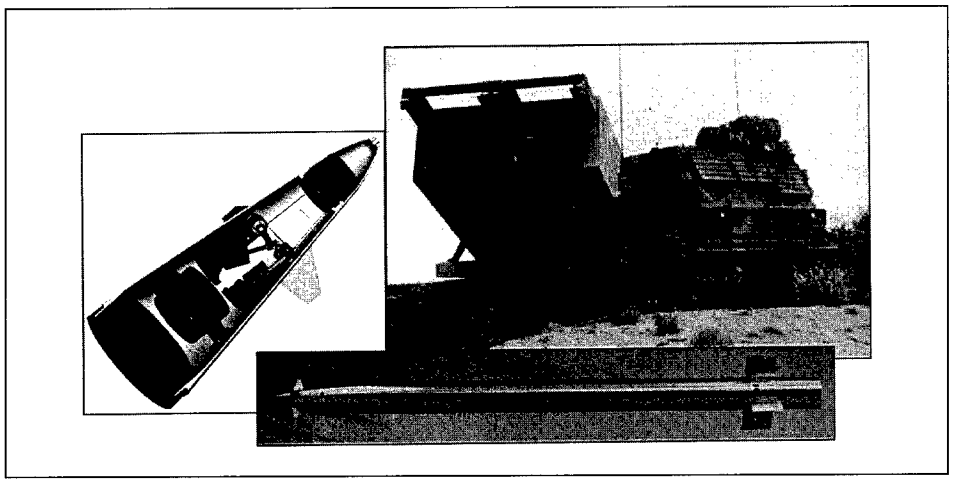

Figure 2.
Guided Multiple Launch Rocket System.

• **Low Cost Precision Kill Guided 2.75-inch Rocket (LCPK)**—Lessons learned in Desert Storm indicated Hellfire missiles had been used against many small non-tank targets because there was not a smaller, lower-cost precision weapon available. To fill this gap, MRDEC's Missile Guidance Directorate is working on a retrofit guidance package for the unguided 2.75-inch rocket used on the Apache and Kiowa Warrior helicopters. The LCPK may employ "scatterrider" guidance, a new form of laser guidance, developed by the MRDEC, that takes advantage of the naturally occurring scattering of light in the atmosphere. Another guidance concept would use a strapdown adaptation of semi-active laser guidance. The guided 2.75-inch rocket can be loaded in existing 7- or 19-round launchers, significantly increasing precision weapon firepower while reducing collateral damage. The current schedule for LCPK calls for hardware-in-the-loop demonstrations in 1998, control test flights in 2000 and full-up guided flights in 2001.

• **Future Missile Technology Integration**—With its variable-thrust rocket motor, state-of-the-art imaging infrared seeker and "hunting" capability, the Future Missile Technology Integration (FMTI) program plans to demonstrate the feasibility that a future missile system could be designed that could perform multiple missions and be launched from multiple launch platforms. Such a missile could satisfy air-to-air, air-to-ground, ground-to-ground and ground-to-air needs that are currently being filled by TOW, Hellfire and Stinger. The seeker and rocket motor have both been tested this year with great success. Flight testing of the complete designs and test results are being supplied to potential Army contractors for systems that would replace TOW and Hellfire in the future.

• **Guided Multiple Launch Rocket System Advanced Technology Demonstration**—The Multiple Launch Rocket System (MLRS) was so devastating during Desert Storm that Iraqi soldiers called it "steel rain." As deadly as this unguided rocket is now, a guided version would provide target elimination with substantially fewer missiles, a much reduced logistics burden and significantly lower overall costs. (See Figure 2.) The MRDEC's Advanced Technology Demonstration will result in the design, fabrication and flight testing of a low-cost guidance and control package that will feature an inertial measurement unit and an optional global positioning system unit. Flight tests are scheduled for 1998.

• **HUMRAAM**—For years the Advanced Medium Range Air-to-Air Missile (AMRAAM) has served the Air Force's and the Navy's medium range air-to-air needs. Now the MRDEC is looking at the possibility of placing AMRAAM on a High Mobility Multipurpose Wheeled Vehicle (HMMWV) for use as a medium range air defense weapon. It was originally known as "559," because it is estimated that this hybrid could be built for $559,000. Constructed completely from off-the-shelf parts, the HMMWV mounted AMRAAM (HUMRAAM) (See photo on the front cover of this issue.) could be used until the Medium Extended Air Defense System (MEADS) is fielded. The HUMRAAM could then be dismantled and recycled. A test firing using AMRAAM ballistic test vehicles was conducted last fall at Eglin Air Force Base, FL, and was completely successful.

The Multimode Airframe Demonstration program, using the LONGFOG, a long-range version of the fiber-optic guided missile, will demonstrate the technology for true precision strike capability for missions ranging up

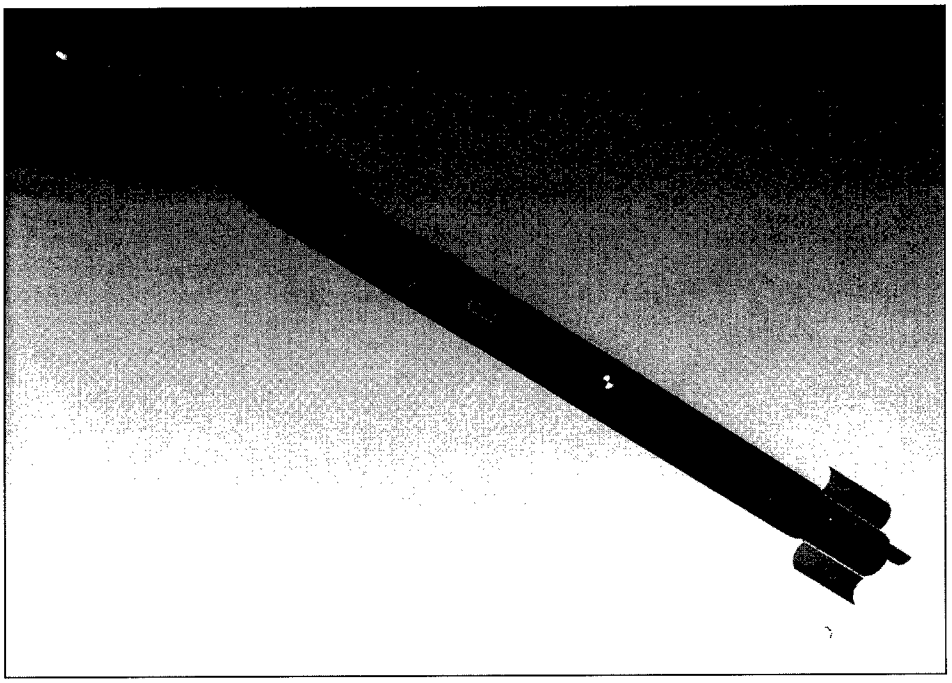

Figure 3.
Compact kinetic energy missile technology applied to a line of sight anti-tank pre-planned product improvement concept.

to 100 kilometers, well beyond the range of the Enhanced Fiber Optic Missile (EFOGM). Currently under development, the EFOGM will have a range of about 15 kilometers. LONGFOG will provide the same advantage of a fiber-optic link that lets the gunner see what the missile sees, can be launched via remote control for enhanced gunner safety, can act as its own forward observer, and provide valuable information for battle damage assessment. Flight tests will be performed at Eglin Air Force Base in 1998.

• **Compact Kinetic Energy Missile (CKEM)**—Future main battle tanks are projected to have sophisticated armors that may defeat current missile warheads. Use of hypervelocity kinetic energy missiles will easily overmatch these armors, virtually destroying the targets. MRDEC is developing technology for such missiles in the CKEM program, with an eye to providing new weapons both for the light forces and as the main armament for the next generation battle tank, called the future combat system (FCS). One application for CKEM being developed at the MRDEC is to provide a smaller missile for the Line of Sight Anti-Tank (LOSAT) weapon system. (See Figure 3.)

These weapons of the future could never materialize without a thorough grounding in the philosophy of the highest technology with a maximum return on investment. The MRDEC takes a common sense approach, insuring that young engineers are mentored and encouraged to do as much hands-on work as possible before spending a year with a project office to gain the customer's perspective. They return to the MRDEC with the ability to direct efforts into a path that is compatible with the future needs of the user.

Value Engineering

The MRDEC is also a strong proponent of Value Engineering (VE). (See the article on Value Engineering by MG Roy E. Beauchamp on page 7 of this issue of *Army RD&A.*) In 1985 the Missile Command was named by the Army Audit Agency as the "Worst Command in VE within DoD." In 1986, the MRDEC took over the VE program and literally turned it around. By dedicating a staff of professionals to the effort, working on achieving creditable savings through documentation and increasing contractor participation, the VE program has accounted for a savings of $3 billion in the past 10 years, and has won the DOD Field Command Award eight out of the last 10 years.

Software Engineering

Future needs are also of great interest to MRDEC's Software Engineering Directorate (SED). Interoperability and avoidance of obsolescence in computing are two major areas of work for the directorate.

So that tomorrow's theater commanders can take advantage of the force multiplier created by a synergistic system of weapons, the SED is working toward the interoperability of missile systems. Creating such a seamless orchestration of different parts of the picture won't be easy, though.

Interoperability of weapons is effected through software, but computer hardware technology is outrunning software technology. The directorate employs several approaches to produce software that is viable and can be updated along with improvements to missile hardware. Faced with a nationwide shortage of computer engineers, the directorate trains its own. The SED actively seeks the opinions of the user—young soldiers who will be using many of its products. These users are regularly invited to participate in exercises using SED products. And the directorate looks not just for high-tech solutions, but actively pursues the low-tech cost savings angle, including making training versions of expensive battlefield computers, and reusing existing software.

MRDEC's Weapon Sciences Directorate has taken on the project of looking many years ahead to the time when computers as we know them can no longer support the information processing needs of the systems they support. The directorate has people working on optical correlation for target acquisition, and on the concept of optical parallel processing. This research may someday produce a computer that can process millions of tasks simultaneously using photons instead of electrons.

Hardware-In-The-Loop Testing

The MRDEC's Advanced Simulation Center (ASC) provides unique hardware-in-the-loop (HWIL) testing for missiles and submunitions. The ASC began testing guidance components through simulation 25 years ago, proving performance through simulation before actual flight tests. The center now consists of 10 separate facilities containing radiation chambers, signal generating equipment and mathematical models of targets and background scenarios. A recent breakthrough in infrared scene generation that employs synthetic missile line of sight control and dual simulation configuration now means that more of the Army's missile inventory can undergo developmental testing at the center.

Simulation

Simulation has also been carried into the missile production area through the means of a new missile acceptance simulation facility that is a joint project between the MRDEC and the Test and Evaluation Command's Redstone Technical Test Center. The Simulation/Test Acceptance Facility(STAF) provides production lot acceptance through simulation instead of expensive "fly to buy" tests that have previously been conducted. The STAF can be used to test "all-up" tactical rounds complete with warheads, conditioned to specified environments. The Hellfire Longbow was the first missile tested in the STAF when it opened in late 1996.

Disposal

The MRDEC is even planning for a safe and thrifty means of disposing of missiles once the shelf life is exhausted. Using technology developed by the MRDEC Propulsion Directorate, rocket motors can be broken down to their basic elements, and be recycled for both military and civilian use, with no threat to the environment. The cheapest and most widely used method of disposal currently is detonation and burial, but environmental considerations make recovery, not just of propellant and fuel, but of all missile components, attractive. Working again in conjunction with the RTTRC, the MRDEC will set up a rocket demilitarization facility at Redstone to perfect this process. After a method is standardized for all compatible missiles (which includes almost every missile with a solid rocket motor, U.S. or foreign), the technology will be transferred to the private sector for contract operation.

Prognostics

The Propulsion Directorate's Service Life Prognostics Program has also enabled service life extensions of many of the command's missile propulsion systems, with documented cost avoidance of almost $8 billion to date.

Conclusion

The MRDEC is continually working to provide its customers with the means to accomplish the mission, from new concepts in rapid troop deployment, to improvements of existing products, to advanced simulation and the computers of the future. The MRDEC will keep the Army fighting—and winning—in the 21st century.

PAM ROGERS is a public affairs specialist in the MICOM Public Affairs Office. She holds a B.A. in communication from the University of Alabama.

VALUE ENGINEERING

A Management Analysis Tool

By MG Roy E. Beauchamp
and Nannette M. Ramsey

Introduction

In February 1996, The National Defense Authorization Act was passed requiring all executive agencies in the government to implement Value Engineering (VE) efforts. The law directs each executive agency to establish and maintain cost-effective VE procedures and processes. VE is defined in Section 36 of the new law as "an analysis of the functions of a program, project, system, product, item of equipment, building, facility, service, or supply of an executive agency, performed by a qualified agency or contractor personnel, directed at improving performance, reliability, quality, safety, and life cycle costs." The VE methodology can apply to plant operation and office work alike, as shown in the law's broad definition.

Historical Perspective

VE has not always been used for such a broad range of applications. VE was originated to intentionally search out alternative materials. During World War II, material was scarce and substitutions were often necessary. General Electric (GE) found that those substitutions sometimes provided a cheaper, better-performing alternative. After the war, GE assigned staff engineer Lawrence Miles to look for a process to search out those types of alternative materials that would perform the same functions as well or better. Miles recognized that proper analysis of an item's function often led to the use of cost saving, performance improving alternative materials and manufacturing methods. He subsequently developed the system of function evaluation called "Value Analysis." About 10 years later, GE introduced Value Analysis to the Navy where it became known as VE. The government has since used VE as a tool for optimizing the functionality of systems and processes, from the office to the factory, at

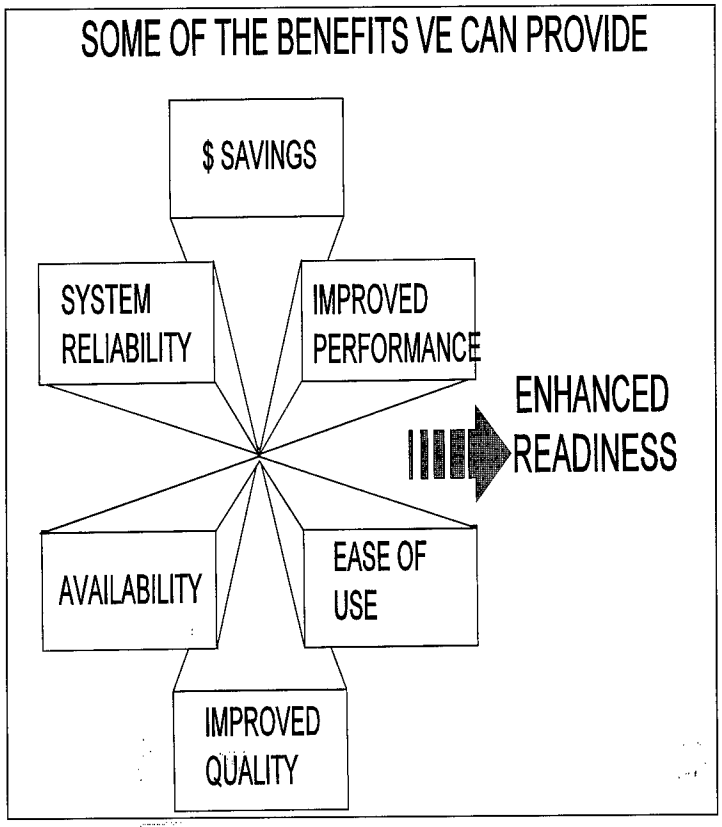

Figure 1. Potential benefits of Value Engineering.

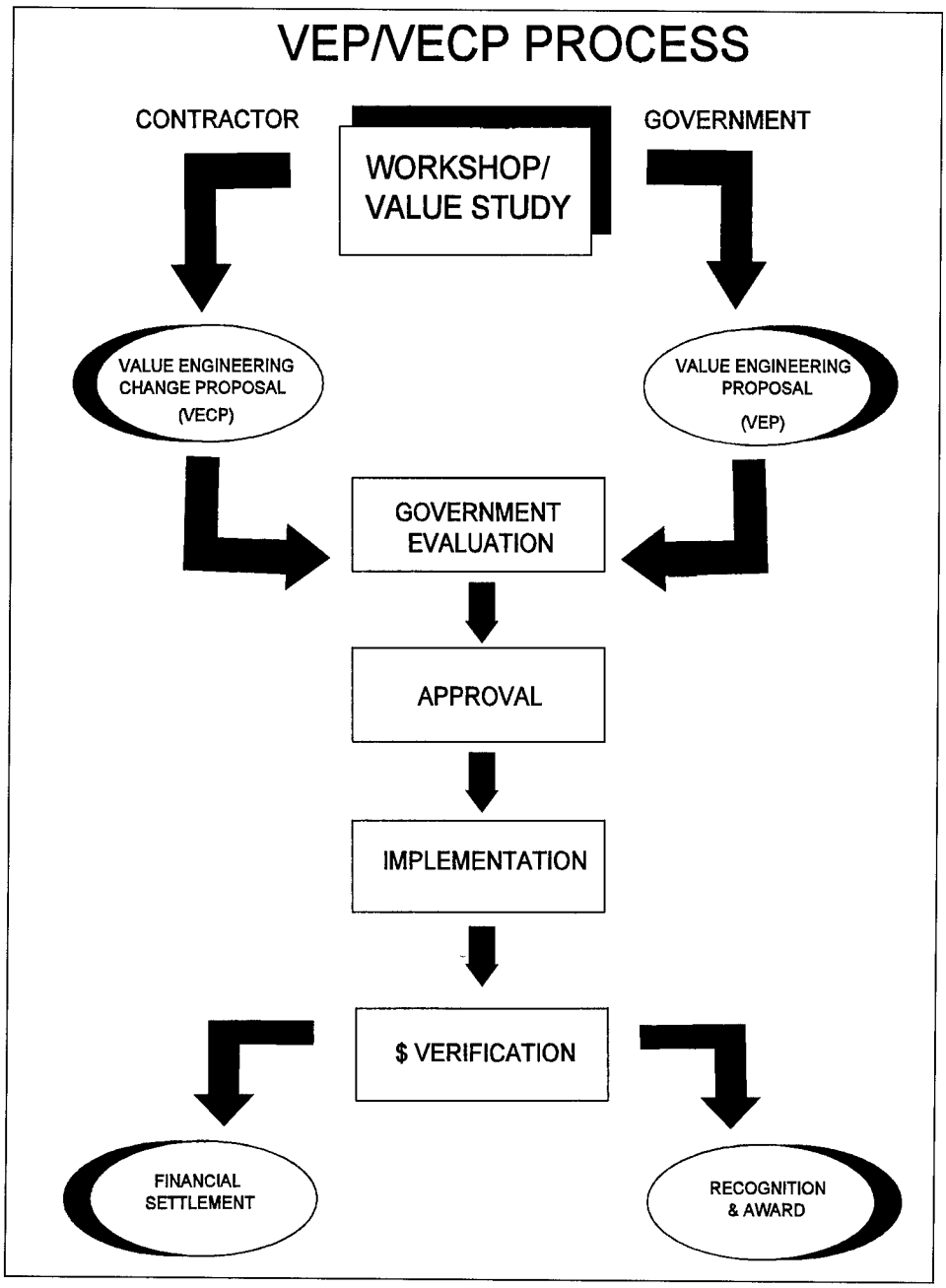

Figure 2.

the lowest possible cost (including life cycle costs).

VE Today

VE is used by many of the agencies in the Department of Defense (DOD) today, and the U.S.Army Materiel Command (AMC) has been one of the most successful users. **AMC VE savings typically represent over 80 percent of total Army VE savings and over half the Department of Defense VE savings.** A return ratio of 10 to one for every dollar invested in the development of a VE idea is not unusual. Although the metrics of the VE program tend to focus on dollar savings, VE often provides benefits such as higher system reliability, availability, improved quality and performance, or ease of use. (See Figure 1.) These benefits can provide the soldier with better equipment and enhance Army readiness.

VE Proposal Process

There are basically two proposal processes used to achieve these VE benefits/savings within the government. The first type of proposal, a Value Engineering Proposal (VEP), is based on government personnel presenting an idea as a VE study candidate. A VE study is conducted and, if the candidate is deemed successful, a VEP is generated and submitted to the appropriate approval authority. If approved, the VEP is implemented, its benefits are verified, and its originators and developers may be rewarded through the AMC VE honorary award program or major subordinate command award program.

The second type of proposal, a Value Engineering Change Proposal (VECP), contains the recommendation for improvement from a contractor, in accordance with the contractual VE provision in their contract which is based on the Federal Acquisition Regulation (FAR). The government evaluates the VECP and approves or disapproves it. If approved, the change is implemented and the government and the contractor ordinarily share in the savings after a financial settlement is reached. (See Figure 2.) It is the government's policy to provide contractors with a substantial financial incentive to undertake VE on the premise that both the government and contractor will benefit. With the VE program, government contractors can earn larger profits and improve their competitive positions while the government receives better value for the dollar.

What Makes The VE Methodology Unique?

VE isn't just the concept of engineers designing value into a system. It is a structured, logical approach that induces people to ask all the fundamental questions which decrease the likelihood that a key issue will be missed. Use of the VE methodology serves to direct resources toward solutions that have the highest potential for meeting customer needs at the lowest cost. Traditional approaches to cost reduction look at a procedure from a methods point of view, asking questions like, "How is that part made?" and "How can we make the part cheaper?" VE goes beyond the obvious and challenges everything and always asks, "What is the **function** of the part or process?", "What is the cost of the ***function***?", "Is the ***function*** required?" and "What else will perform the ***function***?".

While many suggestion programs emanate from ideas that "pop" into someone's head resulting in an improvement and dollar savings, a function analysis of the same idea or process could conceivably find that the particular function in question is not really necessary, and that its elimination would result in even larger savings. A VE proposal is the result of an analysis and evaluation of problem areas or areas for improvement, focusing on function. It is this approach to function that sets VE apart from all other cost-reduction techniques.

Other techniques set out to save dollars, sometimes at the expense of performance, reliability or maintainability. Not so with VE! When an item or procedure is analyzed by the VE methodology, the function of the item/procedure is of primary concern—and

the dollar savings or other improvements come about as a result of the VE process. The process is concerned with providing good value by investigating the value of what the item/procedure does in relation to the money spent on it.

What Exactly Is The VE Methodology?

The typical AMC VE study is conducted by a multi-disciplined team and follows a structured sequence known as the VE Job Plan. Once objectives and opportunities are identified and a team organized, there are generally six phases in the methodology. Figure 3 displays the sequence of the job plan and provides a brief description of each step.

Besides the Job Plan, VE tools can be used to facilitate the analysis with the final result of the VE study being improved value. The value improvement may consist of anything from solving a critical problem that prevents timely fielding of a viable system or in dollar savings that result from technology insertion which is more cost-effective to manufacture.

An Example Of A Recent VE Success

A VE workshop was recently held at the U.S. Army Communications-Electronics Command (CECOM) by the CECOM Value Management Office and Command, Control, Communications, Computer, Intelligence, Electronics, Warfare, and Sensors (C^4IEWS) Specifications Standards Acquisition Reform (SSAR) Team. The objective of the team was to convert the military specifications on the H-250 Handset to Performance Based Specifications with the idea that cost savings could result from the conversion. VE is an excellent tool to use in the conversion to performance specifications, because the VE approach systematically addresses the functional requirements of the item. A performance specification allows the performance to drive the design, allowing the contractor leeway to make design decisions for the best mix. VE assists this process. As a result of using the function-oriented VE methodology, the workshop teams, which included industry, were able to identify a methodology for converting the H-250 specification to a performance-based requirements document. Some of the significant results of the workshops include:

- The conversion of the original military specifications to a draft performance specification including interface requirements;
- The identification of the cable as the major cost driver (55 percent of the H-250 handset cost); and
- Projected savings of almost 20 percent per unit.

In addition, the VE workshop provided the synergy for the government and contractor to become partners in the mutual development of the performance specification.

This example, along with many others, illustrates that, although VE has been around for years, the concepts are as valid today as ever. VE is practiced in 41 countries around the world according to William Lenzer, International Vice President of the Society of American Value Engineers International. This wide usage reflects the advantages of practicing VE.

VE JOB PLAN

Phase	Description
Phase 1 Information	All pertinent, essential information is gathered so that all team members can analyze and completely understand the functions of the item or system under study. The problem is defined and goals are established.
Phase 2 Speculation	The analysis team directs creative effort toward developing alternatives. Creative techniques are used to generate ideas.
Phase 3 Analysis	Alternatives generated are compared to requirements. Costs are assigned to each idea and compared. Unworkable alternatives are dropped.
Phase 4 Development	Implementation problems related to the various alternatives are addressed. Advantages and disadvantages are weighed. The most promising alternatives are developed into proposals for presentation.
Phase 5 Presentation	Alternatives are formally presented to the decision authority. Presentations are factual, concise and acknowledge contributors. Anticipated roadblocks to implementation are identified.
Phase 6 Implementation & Follow-up	An approved implementation plan, with realistic scheduling and well defined responsibilities for action, is executed. Aggressive follow-up is conducted. Delays are minimized by anticipating problems.

Figure 3.

Conclusion

VE has a solid history of contributing to enhanced AMC/Army/DOD readiness and our ability to project a force anywhere in the world. VE is the most effective and relevant tool a program manager can use in a constrained resource environment. Effective application of the VE methodology will continue to attain the best value for the U.S. Army and will enhance the profitability of the private industrial base. We can optimize value in our materiel and achieve acquisition excellence by adopting the VE mind set. This mind set promotes constant improvement in all operations, and the VE methodology provides the tools to achieve those improvements. VE consistently reduces life cycle costs and produces benefits beyond dollar savings. We must continue to capture these benefits on an ongoing basis. VE can help us "do more with less."

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ARMY ADVANCES TELEMEDICINE TECHNOLOGY

By BG Russ Zajtchuk
and CPT Paul Zimnik

A few years ago, Army Chief of Staff GEN Gordon Sullivan received a briefing on the Army Medical Department's vision for technologically advanced health care support for Force XXI. His guidance was simple: "Make it happen."

Consistent with that guidance, the U.S. Army Medical Research and Materiel Command (USAMRMC) is leading a new effort to institutionalize the progress made to date in the development of telemedicine and related advanced technologies for battlefield and peacetime military medicine. This effort involves a coordinated, tri-Service approach to the determination of military medical requirements, and the development or adaptation and standardization of advanced technologies that offer new and better health care solutions.

For several years, the USAMRMC's Medical Advanced Technology Management Office (MATMO) has been exploring numerous concepts, developmental systems and devices in a "skunk works" environment, in search of technological applications that will prove useful to military medicine.

MATMO is transitioning to function as the command's advanced technology (telemedicine) institute for technology assessment, applied research, and rapid prototyping of new telemedicine and advanced medical technology concepts and systems. MATMO will continue to provide the platform for the DOD Telemedicine Test Bed.

A new Telemedicine Technology Area Director (TTAD) in HQ, USAMRMC has been established to focus more attention on gains achievable through future technological innovation. While the wide-ranging exploration of new systems continues in DOD and private sector laboratories, new emphasis will be placed on the task of coordinating telemedicine and related technology and research.

The TTAD will be a focal point for horizontal integration of telemedicine and related technologies, across the entire spectrum of the USAMRMC's business areas. The director will be charged with assessing the command's capability to serve multiple customers and stakeholders who require tech base research and assistance on telemedicine initiatives. The Office of the TTAD will become a technology clearinghouse within the Army to preclude duplication, promote information exchange, and facilitate the efficient use of scarce telemedicine resources throughout DOD.

The USAMRMC is responsible for total life cycle management of medical materiel. For telemedicine systems, the TTAD will be the HQ, USAMRMC focal point for telemedicine technology exploration and development at the tech base level. The office will facilitate oversight for telemedicine research and development programs, projects, and initiatives. It will take the lead for developing the Program 6 investment strategy to support telemedicine and related advanced technology tech base research programs.

It will also provide technical advice to the Commander, USAMRMC as he participates in Army, DOD, and joint federal initiatives in telemedicine and advanced technology. Through the heavy use of virtual information sharing technologies, the jointly-staffed TTAD will work closely with the Office of the Secretary of Defense for Health Affairs, the medical leadership of each of the Services, the DOD Telemedicine Test Bed, and other non-DOD organizations that are stakeholders in telemedicine applications.

In this overarching coordination capacity, the Office of the TTAD will provide a forum for a more coordinated and efficient focus on telemedicine research to support health care management and delivery to the total force.

TELEMEDICINE TECHNOLOGY AREA OFFICE

Stakeholders

DDRE
CINCs
OSD (HA)
Service Surgeon Generals
MHSS Functional Business Mgrs
MHSS IM/IT Community
T-MED Board of Directors & Champions
Service Research Organizations
DISA
ARPA
TRADOC/AMEDDC&S
Commercial Industry
Academia
Joint Federal T-med Committee (HHS, Energy, Trans, VA)

The Telemedicine Technology Area Director will provide advice and support to the Commander of the Medical Research and Materiel Command regarding the telemedicine community/stakeholders initiatives, programs, and future investments.

The TTAD will provide continuous oversight of telemedicine program execution, and will facilitate the transition of telemedicine systems and products out of the technology base and into the advanced development phase. Although primarily responsible for technology base efforts, the director will be a key participant in integrated product and concept teams chartered for telemedicine product development.

The widely diverse efforts of the MATMO and its partners in the other Services, the electronics industry, and academia have resulted in a short list of systems that seem most likely to be fully developed and fielded. They range from micro-electronic devices to expedite far forward medical care to large networks linking medical centers and hospitals spread over wide geographic areas.

• ***The Meditag*** is a high capacity memory device that the soldier will wear as an electronic dog tag. The device will contain the soldier's entire medical record, including X-rays and other diagnostic images. If the soldier requires medical care in the field, the Meditag will be accessed by field medics and field hospital medical staff, so that the injured soldier's medical history is available and, when care is provided in the field, it will be immediately documented.

• ***The Life Support for Trauma and Transport (LSTAT)*** is a patient platform containing intensive-care-unit level of monitoring and ventilation support for trauma patients. The LSTAT platform can be used to transport casualties in field ambulances, helicopters and fixed wing aircraft. The LSTAT can serve as a platform for surgery, post-operative care, and subsequent transport out of the combat zone, if necessary.

• ***The Advanced Surgical Suite for Trauma Care (ASSTC or AZTEC)*** is a complete, containerized surgical facility intended for deployment near the front lines. Its features include: light-weight, rapid setup, with readiness for surgery within one hour of arrival at the deployment site; capacity for triage; multiple simultaneous surgeries; post-surgical recovery area; and prepackaged surgical supplies to support 20 surgeries in the first 24 hours of the deployment. It will also have the capacity to receive remote surgical mentoring through satellite communication with a rear area hospital, and to provide mentoring support to forward deployed medics and physicians caring for casualties at battalion aid stations or enroute to the surgical facility.

Real-world demonstrations over the past several years have proven the value of remote mentoring of deployed medical personnel through satellite communication technology. Projection of medical center expertise forward to overseas units on the ground and at sea has been demonstrated for general medical support, and for specialty consultations including surgery, dermatology, psychiatry, pathology, and dentistry. This is a flexible capability which can be implemented wherever forces deploy.

The Life Support for Trauma and Transport platform contains advanced medical sensors and devices for monitoring critically injured patients. It can also be used as a surgical platform, providing anesthesia support.

• ***The Medical Diagnostic Imaging System (MDIS)*** captures and stores X-rays, CT scans, and any other diagnostic imagery in digital format. It provides the images on demand to physicians at networked workstations. The system eliminates wet chemistry film processing, and storage and retrieval problems associated with large volumes of hard-copy X-ray films. It also allows for sharing of images for remote diagnosis, consultation or training over electronic networks. MDIS is a medical center or large hospital-based system that can be extended to or accessed from remote or far forward areas.

• ***The Mobile Breast Care Center (MBCC)*** illustrates the use of telemedicine to improve community access to care. The Mobile Breast Care Center brings digital mammography and ultrasonography, expertise in breast cancer diagnosis, and breast care counseling and education to under served areas. A digital mammogram or ultrasound taken in the MBCC vehicle will be transmitted electronically for diagnosis at a remote site. The interpretation of the mammogram and counselling information will be transmitted back to the patient waiting in the vehicle. The MBCC will improve the health care available to military women and family members on remote installations. It will also demonstrate to civilian communities that medical care in under served areas can be significantly improved through this technological application.

Each of these systems presents unique challenges to the materiel management system. Each involves a combination of technologies and contractors. Each system offers the potential for improved solutions to established requirements. These systems are products of great changes now occurring in medical technology.

In recognizing telemedicine technology as a separate enterprise area, the USAMRMC has taken definitive steps to bring better oversight and coordination to the field of telemedicine research and development. These steps will also help the USAMRMC develop a focal information source for issues related to telemedicine, to more effectively manage research resources, and to better interface with organizations that manage implementation and fielding of telemedicine technologies. Look for future reports on the progress this office is making in integrating telemedicine and related technologies across the full spectrum of our medical RDTE business areas.

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ARMY RESEARCH: YET ANOTHER CHALLENGE

By Dr. James A. Baker

Fundamental to the operation of the Army Research Lab and key in the strategy to maintain technical excellence in the research program, is the concept of a Federated Laboratory.

Introduction

It is not surprising to those involved in the Department of Defense research and development process that the Services face phenomenal technical and non-technical challenges as we look forward to the 21st century. Each of us, in our own specialty areas, considers the large number of scientific questions that must be addressed to accomplish our programs to support the soldier. We view, with alarm, the dwindling resources available to get those answers. Indeed, the last several years, as a direct consequence of reduced government spending and a shrinking federal workforce, have brought a number of carefully considered restructurings and reorganizations of the Army research program. These efforts have been directed specifically at ensuring that the Army research program is competent, competitive and responsive to the Army's needs.

In October 1992, the Army activated the Army Research Laboratory (ARL), created by restructuring the greater portion of the Army Materiel Command's basic research activities with two goals in mind: greater geographical consolidation and stronger program focus.

The realignment of corporate laboratories (affecting the former Ballistic Research Laboratory, Harry Diamond Laboratory and the Materials Technology Laboratory and others) permitted consolidation into two primary locations with smaller elements at three other sites. A desired outcome of this restructuring was to effect efficiencies in the execution of the Army's non-medical land warfare research program via centralization to focus resources on the highest priority needs and the most promising technology solutions.

Federated Laboratory

Fundamental to the operation of ARL and key in the strategy to maintain technical excellence in the research program, is the concept of a Federated Laboratory. Using contractual procedures, ARL establishes partnerships with academic institutions and private sector firms to address technical problems in areas of mission responsibility where the private sector has the obvious technological lead.

Integrated management of the technical effort is provided through cooperative agreements and personnel resources are integrated through a target for 20 percent exchange of government and non-government scientists and engineers. These exchanges are specifically aimed at cross fertilization and maintenance of technical excellence in times of critically short resources.

Independent Research Program

Concurrent with the establishment of ARL, the Office of the Deputy Assistant Secretary of the Army for Research and Technology strove to increase the quality of the Army research program by increasing the proportion of the research program which remained at the research, development and engineering centers (RDECS) in the In-House Laboratory Independent Research (ILIR) program.

Created by a 1961 memorandum from the Secretary of Defense to the Director of Defense Research and Engineering, the ILIR program provides funds to the technical director or commanding officer of each R&D laboratory or center which he may use with wide latitude to initiate and support efforts judged to be important or promising in the accomplishment of missions assigned to that laboratory or center. The intent is to enable the performance of innovative, timely and promising work without requiring the time-consuming formal and prior approval that might delay normal authorization.

Funding

Funding for the Army ILIR program comes from the Office of the Deputy Assistant Secretary of the Army for Research and Technology and is allocated among the Army labs and centers; the proportion of the total received by each laboratory is determined based upon the success of that laboratory's prior year ILIR program, as judged by a peer review panel established by the Deputy Assistant Secretary.

In judging the ILIR programs, the panel places emphasis on the productivity of the research as evidenced by peer reviewed journal articles published and patents granted as a direct result of the work. Thus, the competition between the laboratories and centers for ILIR funding is a powerful force in maintaining excellence in the technical program.

These initiatives do not come without a price, however. The DOD instruction which establishes policy for the ILIR program specifically indicates that ILIR funds are intended for in-house efforts and should not be used for outside contracts or for the purchase of equipment. Exceptions are possible only when the contract is of exceptional content or when the contract or equipment purchase is in direct support of active current ILIR programs. Further, ILIR projects, if successful, are expected to transition to the core program and to be supported through the normal budget process. Normally, ILIR projects are not supported for more than a three-year period. Also, in the past, peer review panels have commented negatively about the projects when the funding devoted to any one project closely approached or exceeded the cost of one man-year.

Thus, scientists in the laboratories and centers find themselves in the position of being unable to secure the continued collaboration of researchers in academia or to plan a research study contemplating a life of more than three years. This, I believe, has negative implications for the future quality of the development efforts at the RDECs.

A cadre of research scientists represents an invaluable core resource; they provide the necessary level of technical expertise and technological currency to make the centers smart consumers. We routinely turn to these individuals to evaluate technical proposals and to interface with the Army Research Office and the Army Research Laboratory, organizations intended to serve the centers as customers. And with good reason, these researchers provide the scientific knowledge and experience necessary to make the early stages of the centers' development programs technically sound.

An example from our local experience will illustrate. During the period from fiscal 1993 to fiscal 1996, our center's core research program funding fell 60 percent and exploratory development funding fell 36 percent. The magnitude of the cuts forced many hard decisions, including the decision to eliminate one of our core mission areas, decontamination; our customer placed it at the lowest priority and we could not afford to keep it.

In 1992, however, as a result of public concern over the Army's announced plans to build on-site incinerators to destroy the stockpile of unitary chemical warfare agents, Congress instructed the Army to investigate alternative technologies and to recommend disposal technologies for all storage sites. The recommendations were to be based upon recommendations of the Committee on Review and Evaluation of the Army Chemical Stockpile Disposal Program established by the National Research Council (NRC). Those recommendations were published in 1994.

Our core decontamination scientists testified before the NRC Committee which identified possible technologies. Their knowledge of decontamination chemistry formed the basis of the chemical destruction technologies recommended for study by the committee. Since 1994, those same scientists have been conducting the experiments necessary to establish the efficacy of those recommendations. That work is nearing completion. We, at the center, firmly believe that we would not have been able to successfully conduct this service to the country in the time allotted had our core of decontamination researchers not been available.

Conclusion

We, in the Army, must find a way within the resources available to allow the RDECs to create a scientific atmosphere which will allow them to maintain a core cadre of top notch research scientists to support the scientific health of our technology programs. Perhaps a revision to the ILIR program guidelines would be the simplest solution. For example, we could discourage contracts to large commercial firms, as being indicative of significant contracting out of the research, and encouraging the more modest contributions to academic institutions as being representative of truly collaborative work.

We in the Army must find a way within the resources available to allow the Research, Development and Engineering Centers to create a scientific atmosphere which will allow them to maintain a core cadre of top notch research scientists to support the scientific health of our technology programs.

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STREAMLINING THE INTEGRATED ACQUISITION PROCESS FOR SOLDIERS' CLOTHING AND INDIVIDUAL EQUIPMENT

A Continuous Process Improvement

By Gary Olejniczak and Chuck Gidley

Introduction

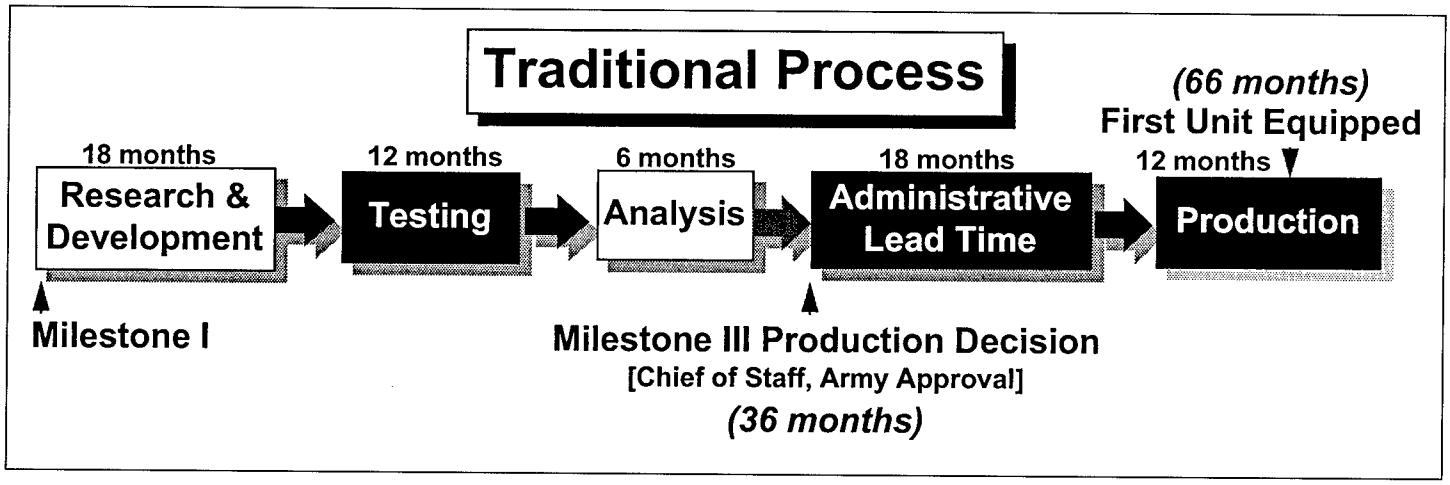
The Army leadership recognizes the importance of efficiently fielding new and improved clothing and individual equipment for our soldiers, especially in times of declining resources. U.S. involvement in Panama, Southwest Asia, Somalia, and Bosnia has only served to demonstrate the significance of a well-prepared soldier on the battlefield. The success of our soldiers and their quality of life in a hostile environment is dependent on tailoring an acquisition process that can quickly deliver technologically superior protective clothing and individual equipment.

The acquisition of clothing and individual equipment presents many unique challenges to the traditional DOD materiel acquisition process. The sophistication of most modern major weapons systems has defined small and very specialized technical expert and user groups. In comparison, everyone who wears clothing is a potential expert. Materiel developers at the U.S. Army Soldier Systems Command must work with this wide base of "experts," each having an individual viewpoint and willing to help guide the materiel developers' programs. A clothing or individual equipment development program must result in a product that has the confidence of all soldiers. Materiel developers have learned to conduct their business, given these many "experts." However, there are other facets unique to the clothing and individual equipment acquisition process that further complicate their mission.

The Players

The process to field modernized clothing and individual equipment is crafted by several key agencies throughout the Army and DOD, with some uncommon features. The Commanding General of the Soldier Systems Command has milestone decision authority for organizational clothing and individual equipment, but the authority for dress uniforms and clothing bag items rests with the Army Chief of Staff.

Within the Soldier Systems Command, the Project Manager—Soldier manages the research, development, test and evaluation programs, the transition to production and initial fielding. Working closely with the Project Manager—Soldier, the Natick Research, Development and Engineering Center at the Soldier Systems Command executes the clothing and individual equipment development programs and develops the technical data.



The U.S. Army Training and Doctrine Command's (TRADOC's) Systems Manager—Soldier is the user representative working with the schools and the field to develop requirements, basis of issue, and fielding priority. As TRADOC's interface with its schools and the Project Manager—Soldier, TRADOC's Systems Manager—Soldier plays a key role in the acquisition process. Other key Army agencies involved in the clothing and individual equipment acquisition process include the Operational Test and Evaluation Command, Test and Evaluation Command, Office of the Surgeon General and other Services.

Very important to the fielding of clothing and individual equipment is the specification preparation and production procurement responsibility of the Defense Logistics Agency. Their Defense Personnel Support Center is the preparing activity for the final specification that is used to execute the large-scale production procurement and sustainment of items. Standardization efforts for clothing and individual equipment are fully coordinated with the other Services, in particular, with the U.S. Marine Corps Project Manager for Combat Service Support, to take advantage of the commonality in their missions and Army materiel needs.

Continuous Process Improvement

In 1991, before the latest push in acquisition reform, the Project Manager—Soldier began laying the groundwork to reengineer the business processes for introducing modern clothing and individual equipment into the Army inventory. Continuous review and adjustment have reduced schedule time and increased efficiency. Any changes must consider balancing the technical and business facets relating to risk, funding, competing programs and current inventory, against the needs in terms of urgency and extent of deficiencies.

Process improvements must provide for immediate response, as well as more deliberate research, development, test and evaluation for more "high tech" requirements. The research, development, test and evaluation time had already been reduced by two years using a process tailored for clothing and individual equipment in Army Regulation 700-86, Life Cycle Management of Clothing and Individual Equipment. However, it simply took too long using a tailored, yet full development process, to go from requirements approval to "in the hands of the soldiers." The players continued to dissect the process and learn where efficiencies were possible.

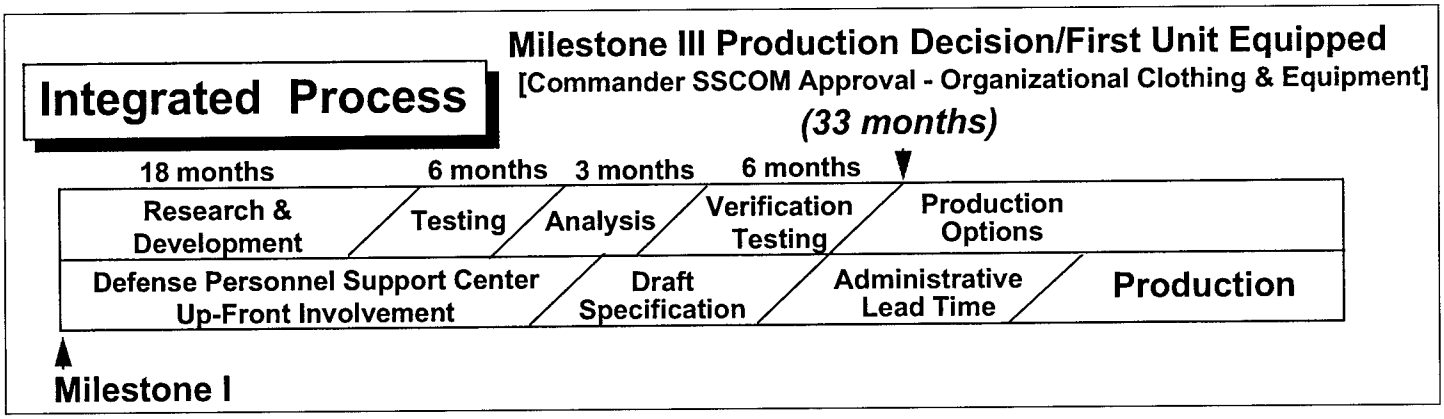
An initial important change was made in the way new clothing and individual equipment was fielded. A "push" rather than a "pull" system was put in place in 1991 to improve the process of fielding modernized clothing and individual equipment to priority units. Funding for all new clothing and individual equipment was consolidated. The Project Manager—Soldier now develops a fielding priority with TRADOC's Systems Manager—Soldier as the user representative, that is approved annually by the Army's Deputy Chief of Staff for Operations. This central funding and fielding process allows new clothing and individual equipment to be issued to the "first to fight" units via a "push" process. To date, more than $565,000,000 of new clothing and individual equipment has been issued through this process.

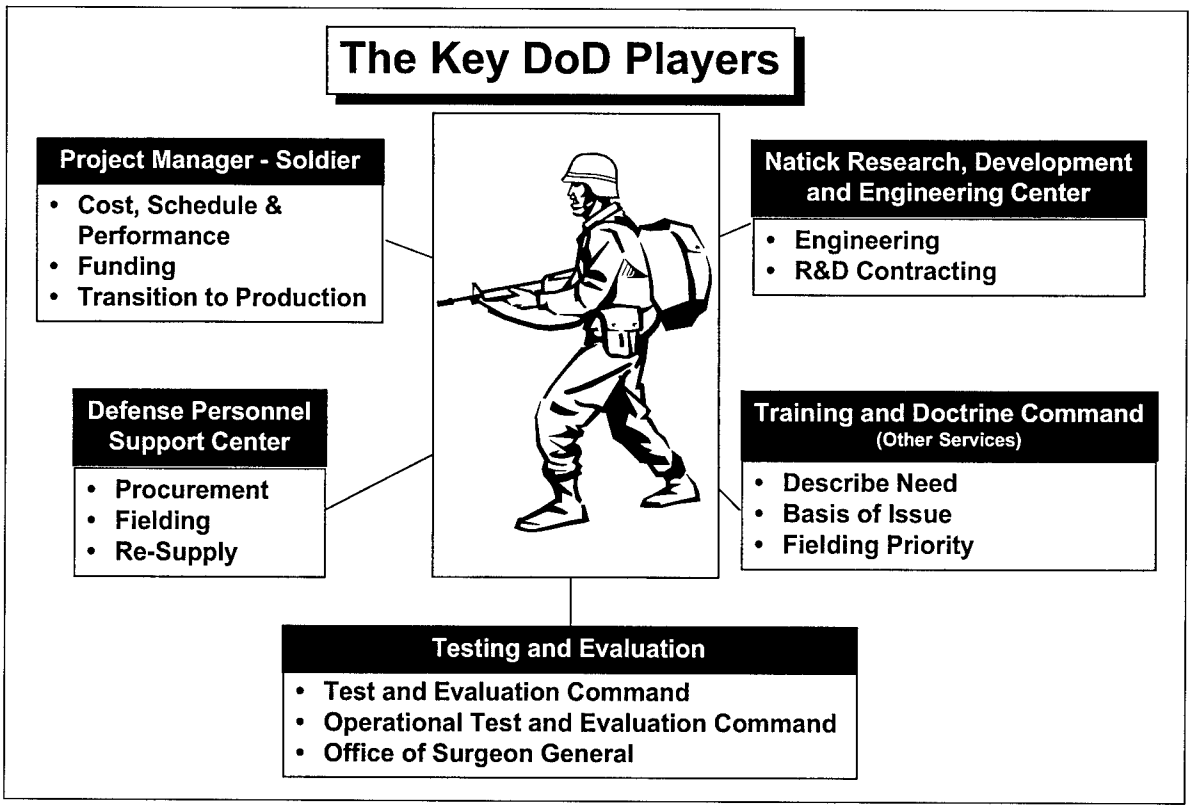
A Clothing and Individual Equipment Process Action Team was chartered in 1993 to take a comprehensive look at the entire acquisition process. Chaired by the Army's Deputy Chief of Staff for Logistics and the Commanding General of the Quartermaster School, the team developed strategies that have been implemented to further streamline the clothing and individual equipment acquisition process. Documentation review bodies have been eliminated, and clothing and individual equipment unique acquisition documentation has been tailored further. Testing is reduced to a minimum, in line with the risk level of the technology and the complexity of the system, with a preference of using shorter commercial or non-developmental item acquisition strategy models.

The way in which the transition to production was handled was found to be a significant driver in the time from the initiation of a development program to the first unit equipped. Capitalizing on the success of the Clothing and Individual Equipment Process Action Team, the Project Manager—Soldier created the Transition to Production Process Action Team, co-chaired with the Defense Personnel Support Center.

Transition To Production Challenge

Although there have been many initiatives and changes to streamline the clothing and individual equipment acquisition process over the years, the players were still faced with an unacceptable period of 30 months from the time of type classification to first unit equipped. The front-end of the acquisition process had been simplified from the point that once there was a concept demonstration approval at milestone I, the phase I demonstration and validation, and phase II engineering and manufacturing development would be combined. The next decision would be a milestone III production approval. With the establishment of the Soldier Systems Command in November 1994, the Commanding General was now the milestone decision authority for organizational clothing and individual equipment. This reduced the time previously involved in staffing that decision to the Army Chief of Staff level. Even so, once the required engineering data was provided to the Defense Personnel Support Center at the Milestone III decision, allowing them to begin the specification preparation and production solicitation process, approximately 18 months in procurement administrative lead time was required before award of the first production contract. It would then be another year after contract award before the first production units were shipped to the field. Technological advances from clothing and individual equipment development programs needed to get into the hands of soldiers in the field more quickly.





In Search Of The Solution

With the impetus of acquisition reform and knowing the adage that "none of us is as smart as all of us," the Transition to Production Process Action Team began their effort in 1994 to study the clothing and individual equipment transition to production process. Players representing every aspect of development and production were represented on the team, which included the materiel developer, production contract experts, and user representation. Also knowing that dramatic improvements could not result from streamlining a process with roots in old paradigms, the Project Manager—Soldier led this team looking at "reengineering" the entire clothing and individual equipment acquisition process. Since the advent of the new DoD Directive 5000.1 (Defense Acquisition) was on the horizon, the process action team knew they would have wide latitude to continue tailoring a process specific to the unique needs for clothing and individual equipment acquisition. The team decided a radical redesign of the entire acquisition process was the only solution to provide a dramatic reduction in the time to first unit equipped.

The New Process

With this goal of providing a substantial reduction in the time to first unit equipped, the team developed a process to provide initial production units to the field no later than 33 months from program initiation. The new process would reduce the time to first unit equipped by 50 percent, compared to an old-style, full-scale development program. A key to this process was the up-front involvement of the production expertise at the Defense Personnel Support Center at the beginning of a new development program. The strategy included an integration of the initial production quantities in the research and development contract, rather than waiting for the Defense Personnel Support Center to award a separate production contract. Although simple in concept, this aspect was not easy to implement since it required combining the organizational responsibilities of a DOD-level agency and an Army organization. The test period during development could also be shortened with development and operational testing continuing to be combined to the maximum extent. This shorter test period was possible, since a production verification test with the same contractor would be used to prove the viability of the item before it was approved for production at milestone III. After successful completion of the production verification test, the new item would be approved for Army use and the contractor could immediately begin delivery of the first production units to the field.

Other Significant Fallout Improvements

With the up-front involvement of the Defense Personnel Support Center, their specification preparation and production contract planning can take place concurrently with the production verification testing and the delivery of the production options under the development contact. Future production contracts at the Defense Personnel Support Center will incorporate new competition and the lessons learned from industry during the initial production into the performance specification. This should translate into cost savings during follow-on production. The Defense Personnel Support Center will continue the fielding once the initial production options on the development contract are exhausted, with minimal, or no break in the supply actions. Bringing the Defense Personnel Support Center into the acquisition process from the beginning will ensure that the sustainment and readiness, and industrial base perspectives are integrated into the total process to develop performance specifications, rather than as an afterthought to the development process.

Another very significant fallout of this new process is the inherent need to establish an integrated acquisition team. This team is in complete agreement with the concept of integrated product and process development/management with integrated product teams. The new clothing and individual equipment acquisition process and the integrated acquisition teams will form the basis of institutionalizing integrated product and process development/management for clothing and individual equipment acquisition programs. The new process was

developed with user representation and maintains their extensive input, enabling the application of the cost as an independent variable concept to clothing and individual equipment programs. Options on "how to buy," including the use of qualified manufacturing and product lists, commercial item descriptions, and best value contracts, as well as planning for phase-out of replaced stocks, can be addressed early in the acquisition planning with the right players.

Additional efficiencies will be realized by the players to reduce the risk of accelerated schedules and the reductions in funds. The Defense Personnel Support Center has initiated new business practices to reduce supply transition costs and inventory levels. Some of the new initiatives include direct vendor delivery, quick response delivery, vendor managed inventory, cross docking and prime vendor. All of these Defense Personnel Support Center programs are designed to improve service to their customers by getting products to them, "quicker, better, and cheaper." The integrated acquisition team can plan for "technical insertion" points and early fielding of prototypes after early user tests. Together, all the players, involved from the very beginning of a clothing and individual equipment program, reduce the risk of cutting schedules too much, while still expediting fielding to the soldiers.

Institutionalizing The Process

As with any significant shift in culture, steps must be taken to ensure that the new way of doing business becomes part of everyone's normal routine. The new process must be institutionalized in the acquisition system and reinforced by top-level management. To this end, a memorandum of agreement was written to formalize the key working relationship between the Defense Personnel Support Center and the Soldier Systems Command, and endorsed by the commanders of both organizations. With the release of the new DOD 5000-series acquisition policy documents, the resulting revisions in the Army implementing policy, in particular, AR 70-1 (Army Acquisition Policy) will include new sections that address clothing and individual equipment acquisition.

The new integrated acquisition process does not mean that every clothing and individual equipment acquisition program will take 33 months from initiation to first unit equipped. On the contrary, the Project Manager—Soldier has written a detailed handbook, specific to clothing and individual equipment acquisition that not only addresses the integrated acquisition process described here for full development programs, but encourages the aggressive use of commercial and non-developmental technology. Relying on the commercial marketplace to meet military needs, when feasible, has shown further quantum reductions in acquisition schedules are possible. The potential of this philosophy has already been demonstrated via adoption of a non-developmental item, based on a commercial item description for a parachutist ankle brace. This was achieved in a three-month time frame from need identification to type classification.

To complement the formal documentation, the Project Manager—Soldier has established regular senior-level management reviews by all stake holders in the clothing and individual equipment acquisition process to closely monitor the development and transition to production. Problems are surfaced and addressed as they occur. The integrated acquisition teams brief their assigned programs to this senior management review panel, addressing the current status of the development, transition to production, contract award, deliveries, funding and fielding. Depending on the particular stage of the program, the lead for these briefings will shift to the appropriate organization, but the integrated acquisition team, as a whole, is still responsible for the daily program management. Senior test integration working groups also review all clothing and individual equipment scheduled for testing with the development and operational testers. Testing will be consolidated into "windows" to further reduce costs and schedules. The entire process implements the teamwork necessary across organizations, to expedite transition to production and fielding of clothing and individual equipment.

Process improvement, innovation, and streamlining will never end. The continued commitment to acquisition streamlining and reengineering of the clothing and individual equipment development and fielding processes is essential to provide our soldiers with the best technology, at an affordable price within the shortest period of time. The Soldier Systems Command is dedicated to champion the soldier as a system in assuring the decisive materiel edge for the 21st century warrior.

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CHUCK GIDLEY is currently serving as Deputy Project Manager—Soldier. He is a graduate of the Defense Systems Management College and Harvard Senior Executives Fellows Program.

A NEW APPROACH TO INFRARED DETECTOR MANUFACTURE

By Dr. John H. Dinan

Introduction

During the past decade, infrared (IR) imaging systems have played an important role in military operations. Extensive use is made of these systems on helicopters, combat vehicles, missiles, and in man-portable equipment. Over the course of the next decade, DOD is planning to retrofit existing systems with second generation imagers and is developing even more advanced devices that will be "smart" enough to transfer part of the burden of target acquisition and identification from the soldier to the device itself.

At the heart of the highest performance IR imaging systems is a microchip made of the exotic alloy mercury cadmium telluride (HgCdTe). HgCdTe is a recently synthesized addition to the family of semiconductors of which silicon and gallium arsenide are the more famous members.

In the late 1980s, HgCdTe material's technology became mature and DOD shifted the emphasis away from device feasibility demonstrations to considerations of manufacturing yield and product cost. It became apparent that the techniques and machines that had been used so successfully to fabricate silicon devices had to be extended to the very limits of their effectiveness to accommodate the much more delicate HgCdTe material. Because of this, yields were low and product cost was high.

In 1990, scientists at the U.S. Army Communications-Electronics Command Night Vision and Electronic Sensors Directorate (NVESD) at Fort Belvoir, VA, proposed a new approach to detector array manufacturing which has the potential to overcome the deficiencies of conventional semiconductor fabrication lines. A prototype of this advanced approach is in operation at Fort Belvoir and is currently dedicated to the manufacture of advanced focal plane arrays.

The microfactory is the focus of this article. To appreciate the potential advantages over existing manufacturing methods, one must journey into the realm of semiconductor processing technology where complex devices with dimensions on the order of microns are commonplace. In this article, we describe the microfactory, follow a wafer as detectors are fabricated, examine the status of this new technology, and indicate how it is expected to have applications to components other than IR sensors.

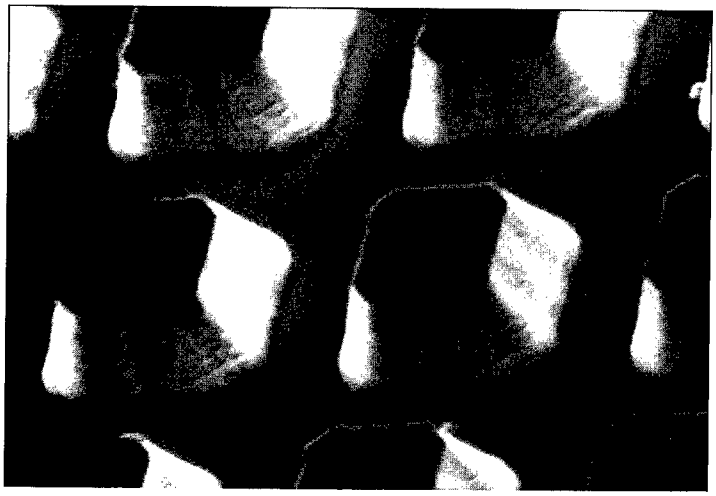

Figure 1. Magnified view of the mesa pixels in an infrared detector array.

Infrared Detector Arrays

Detection of visible radiation by the human eye occurs at the retina which is segmented into rods and cones, each of which captures a tiny portion of the image presented to it by the lens. The artificial retina used to detect IR radiation is also segmented into an array of individual detectors, called pixels. Each pixel can be made sensitive to radiation of short wavelength (1-2 microns), medium wavelength (3-5 microns), or long wavelengths (8-12 microns) merely by adjusting the fraction of mercury in the HgCdTe alloy. The detector array format used in second generation Forward Looking Infrared systems consists of 960 x 4 pixels. For future large area staring arrays, this format will be extended to 1,024 x 1,024 pixels. These pixels are in the shape of mesas whose dimensions are on the order of tens of micrometers. A highly magnified view of pixels in a typical array is shown in Figure 1 and a schematic showing the complexity of such a pixel is given in Figure 2. The device shown in Figure 2 is known as a photovoltaic diode.

To fabricate an array of diodes, as many as 50-100 processing steps must be carried out. Here we will describe the four major steps:

- The first is synthesis of HgCdTe, the absorber of the IR. For a diode, two thin planar layers of HgCdTe, one containing indium atoms and one containing arsenic atoms, must be deposited on a single crystal substrate wafer. This substrate wafer, which is optically transparent with a crystalline structure matching that of HgCdTe, is also planar.
- The second step is to reshape these layers into an array of electrically isolated pixels. To accomplish this the processes of photolithography and chemical etching are used.
- The third step is to deposit an electrically conductive metallic film onto each HgCdTe pixel. Electrical wires carry the charge (produced by IR radiation) away from the HgCdTe pixel and into an electronic readout circuit.
- The fourth step is to protect the device from subsequent contamination or damage by depositing an electrically insulating layer onto the mesa sidewalls.

Conventional Fabrication Lines and Impetus For Change

An artist's sketch of a fabrication "line" used to manufacture silicon devices like computer chips is shown in Figure 3. In the early 1980s, when HgCdTe epilayers be-

came available, this silicon manufacturing technology was already mature enough to be used for carrying out the steps listed above. On such a line, HgCdTe layers are deposited by liquid phase epitaxy (LPE) whereby a substrate wafer is placed into contact with a liquid melt of mercury, cadmium, and tellurium and the layer is precipitated from solution by cooling. On such a conventional line, humans transport cassettes of wafers from station to station and insert a cassette into a reactor where dozens of wafers are treated simultaneously. To avoid contamination of wafer surfaces by debris, dust, or airborne chemicals and water vapor, all equipment is located in "clean rooms" whose atmosphere is rigidly controlled.

A number of factors led to a rethinking of this conventional approach to infrared detector manufacture. The most important of these for second generation detectors was cost. The low manufacturing yield for HgCdTe arrays made on conventional processing lines kept the cost of this product high. The clean rooms required to house the equipment and workers are expensive to build and to maintain. An additional cost is incurred because conventional lines are not flexible with respect to product mix. For instance, an LPE reactor which is "tuned" to produce medium wavelength IR devices is not used to produce long wavelength IR devices. This means that a vendor must maintain separate reactors for each IR product. Finally, the process is not amenable to producing the next generation of IR devices. These are expected to consist of very large arrays of pixels each consisting of multiple HgCdTe layers to provide multi-spectral detection at each pixel. Fabrication of such devices at even modest levels of yield is beyond the capability of current production lines. Thus, conventional semiconductor manufacturing lines are not well-suited to DOD production needs for current generation devices and are not readily adaptable to the complex structures anticipated for next generation devices.

Proposed Solution

The inspiration for a solution was rooted in the emergence of a new deposition technology—molecular beam epitaxy (MBE)—from university research laboratories in the late 1980s. To deposit a layer of HgCdTe by MBE, one places the substrate wafer into a vacuum chamber and directs atomic and molecular beams of the three elements from evaporation cells onto the surface. These atoms condense and an ordered crystal is built up on the wafer one atomic layer at a time.

The chemistry of MBE deposition is fundamentally different from that of LPE in that the process is dominated by the kinetics of the species on the wafer surface rather than by thermodynamic equilibrium. This difference can be exploited to produce more

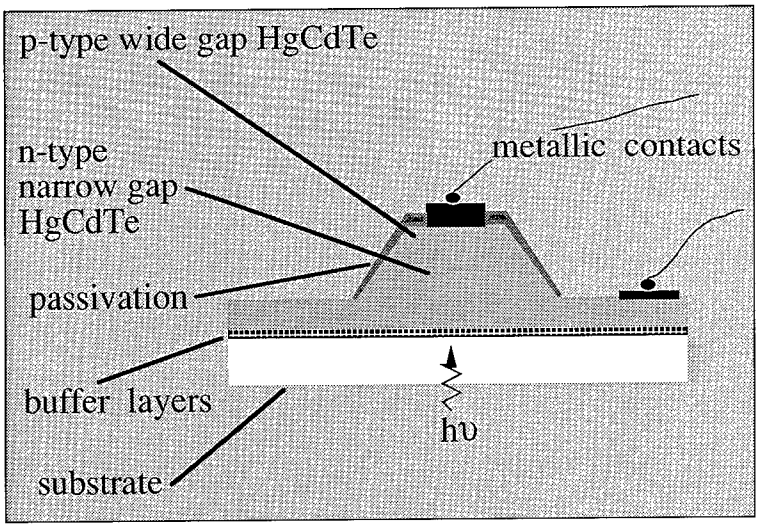

Figure 2. Photovoltaic Diode

complex multilayered structures and larger arrays than are possible with LPE. Moreover, a single reactor can be used to produce any conceivable IR device simply by changing the temperature of the substrate or the flux from a cell. The fact that the MBE process is carried out with the wafer in a vacuum chamber opens up a new realm of process control that is not possible with LPE.

In 1987 at NVESD, a decision was made to abandon other techniques and concentrate exclusively on MBE for our internal IR research program. Once this decision had been made, it was natural to ask whether the very attractive attributes of in-vacuum deposition could be extended to the other processes on the list. If photolithography, etching, metallization, and passivation could be carried out in vacuum chambers, then the process control being developed for deposition might be applied to these other processes as well. And finally, if these separate process chambers were to be connected to each other in such a way that a wafer could be passed among them without removing it from a vacuum environment, then one could imagine dispensing with the clean room facility because a wafer once inserted into such a system would remain in a protective environment until processing was completed. This linking together of a series of vacuum modules in such a way that

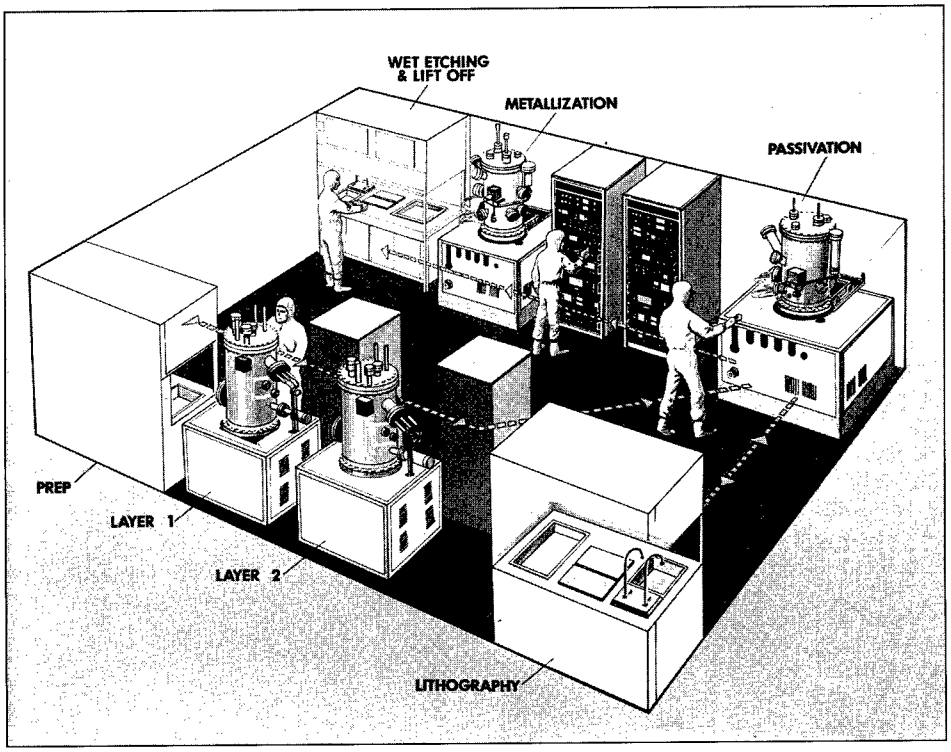

Figure 3.
Artist sketch of a typical semiconductor device fabrication line.

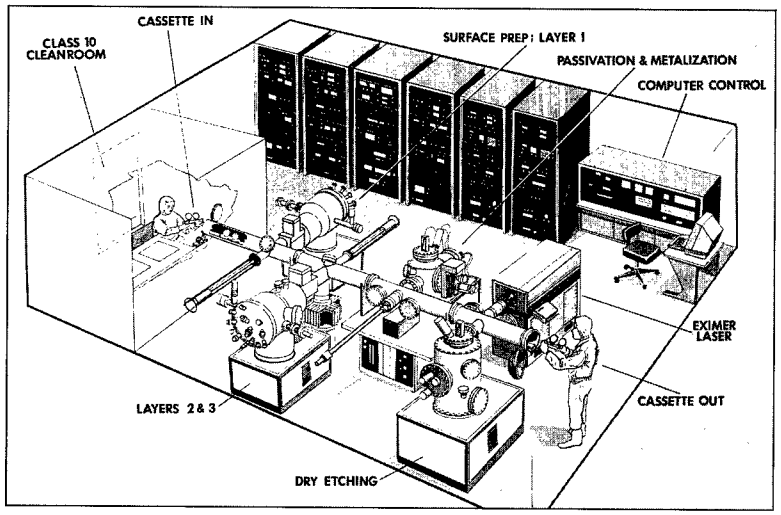

Figure 4.
Artist's sketch of the Night Vision Electronic Sensors Directorate microfactory.

wafers can be transported from chamber to chamber under controlled conditions is the fundamental difference between the new manufacturing line and the existing one and this constitutes a revolutionary approach to semiconductor device processing.

The Microfactory

An embodiment of this concept is the NVESD microfactory which was established at Fort Belvoir in 1991. An artist's sketch of the facility is shown in Figure 4. As presently configured, there are modules for deposition of HgCdTe by the technique of MBE, for deposition of gallium arsenide by MBE, for deposition of metals, and for etching these layers to form devices. In FY97, a fifth module for photolithographic mask making will be added.

For the most part, conventional semiconductor manufacturing is carried out in a set-and-forget mode. Only after a process is completed is it possible to examine the result and either pass the wafer on to the next step or reject the wafer and begin again. Processing wafers in a vacuum environment leads to the exciting possibility of monitoring and controlling the processes in real time. This is based on the fact that the surface of a wafer in a vacuum chamber is easily accessible to a variety of electron and photon beams. These beams can be used to interrogate the atomic structure and chemistry of the atoms at the surface and return information on the efficacy of the process. A first step toward this real time evaluation was taken by NVESD scientists during FY 95/96 in conjunction with a Small Business Innovative Research contract. We demonstrated that the cadmium content of a HgCdTe alloy could not only be measured during deposition but could actually be controlled in real time. When implemented as a part of the production process, this is expected to lead to a higher yield than is currently possible. The end result is, of course, arrays that are more affordable.

Status

When the microfactory was installed, no precedent existed for a facility of this kind dedicated to compound semiconductors. The first order of business was to demonstrate feasibility of each of the vacuum processes. After four years of effort, this goal has been achieved. Layers deposited by MBE have characteristics equivalent to those deposited by LPE. Mesas etched in a plasma have characteristics that are similar to, but not yet equivalent to, those etched in liquids. The following demonstrations are scheduled for FY 97/98:

1) Fabricate an IR array with state of the art performance by carrying out all processes in the microfactory.

2) Demonstrate that the manufacturing yield for an integrated vacuum process exceeds that of the incumbent technology.

Applications Beyond IR Detectors

The integrated vacuum processing approach that is the essence of the microfactory concept has applications beyond that of IR detector technology. All semiconductor devices are candidates for microfactory fabrication. Examples of these are the silicon memory chips in computers and the gallium arsenide chips used in light-emitting laser diodes, in rangefinding and tracking systems and in millimeter/microwave radars. NVESD intends to show the usefulness of the microfactory concept using HgCdTe IR detectors as demonstration vehicles and then extend this technique to lasers. The IR community needs lasers integrated with IR detectors to enable high-speed readout of megapixel arrays.

Relationship With Industry—The Consortium

Ultimately, the tens of thousands of IR products required by DOD will be manufactured at industrial sites and not in a government laboratory. In 1993, a consortium of government, university, and industrial partners was formed and funded under the aegis of the Defense Advanced Research Projects Agency (DARPA) to accelerate the pace of development of MBE technology. NVESD has utilized this consortium mechanism to involve potential industrial microfactory users in the feasibility demonstration phase. Industrial scientists have worked with NVESD scientists in co-developing the individual processes and therefore have an intimate knowledge of these processes. If successful, the technology developed under this consortium will already be on hand in the industry. No formal and separate technology-transfer phase will be required.

Summary

A novel concept for the manufacturing of compound semiconductor devices is being investigated at the Army Night Vision and Electronic Sensors Directorate at Fort Belvoir, VA. The essential difference between the new concept and existing manufacturing methods is that all processes are carried out with a wafer in the protective environment of high-vacuum chambers. The first demonstration of the concept will involve fabricating HgCdTe photovoltaic diode arrays for high performance IR sensor applications. If feasible and cost-effective, the concept could be extended to the manufacture of lasers and high-speed microwave circuits.

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'TO THE SOLDIER' PM TRADE ACQUISITION REFORM INITIATIVES

By MAJ Mark Danison

Introduction

The Simulation Training and Instrumentation Command (STRICOM) is a major subordinate command (MSC) within the Army Materiel Command (AMC). STRICOM is an integrated command comprising four program managers: Training Devices (PM TRADE); Combined Arms Tactical Trainers (PM CATT); Distributed Interactive Simulations; and Instrumentation, Targets and Threat Simulators, as well as the following directorates: Research and Engineering Management; Logistics; Acquisition, Resources Management; Strategic Business Planning; and Integration.

STRICOM's 500-plus employees handle approximately $735 million in business annually. Its location within Central Florida's Research Park takes advantage of synergy realized by collocation with 140 commercial simulation and training related corporations and the simulation and training organizations for the U.S. Navy, U.S. Marine Corps, and U.S. Air Force. STRICOM is within 30 miles of NASA, Walt Disney World, and Universal Studios, all of which are significant users of simulation technology.

PM TRADE, STRICOM's longest existing project office, has three product managers. These are: Ground Combat Training Systems, Combat Support Training Systems and the Air and Command Training Systems. Together, they manage about 100 programs with annual business in excess of $243 million. Past PM TRADE programmatic successes include such well known training devices as Multiple Integrated Laser Engagement Systems (MILES), Precision Range Integrated Maneuver Exercise, Conduct-of-Fire-Trainer, and Air Ground Engagement System II.

On June 18, 1996, PM TRADE briefed the Honorable Gilbert F. Decker, Assistant Secretary of the Army for Research, Development and Acquisition (ASARDA), on some of the acquisition reform initiatives being employed at STRICOM to facilitate quicker and more cost-effective support to the soldier. Others attendees at the briefing were GEN Johnny E. Wilson, AMC Commander; LTG Ronald V. Hite, Military Deputy to the ASARDA; BG(P) (now MG) Roy E. Beauchamp, AMC Deputy Chief for Staff for Research, Development and Engineering (now Research, Development & Acquisition); and Dale G. Adams, AMC Principal Deputy for Acquisition.

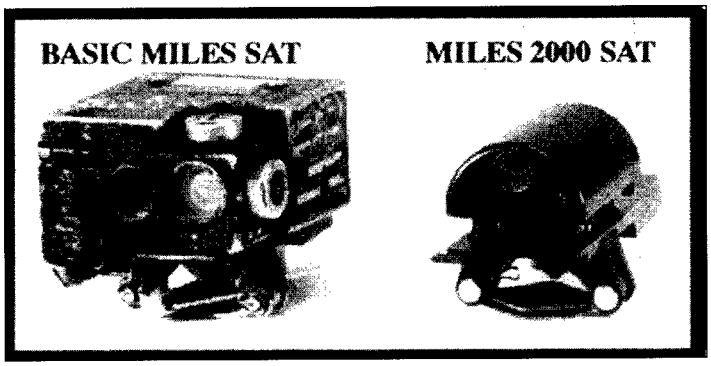
Four of the seven programs briefed to the Army are presented in this article. These are the Advanced Gunnery Training Systems, Multiple Integrated Laser Engagement System 2000, Improved Target Acquisition System and the Fire Support Combined Arms Tactical Trainer. Their related acquisition reform highlights are presented below.

Advanced Gunnery Training System

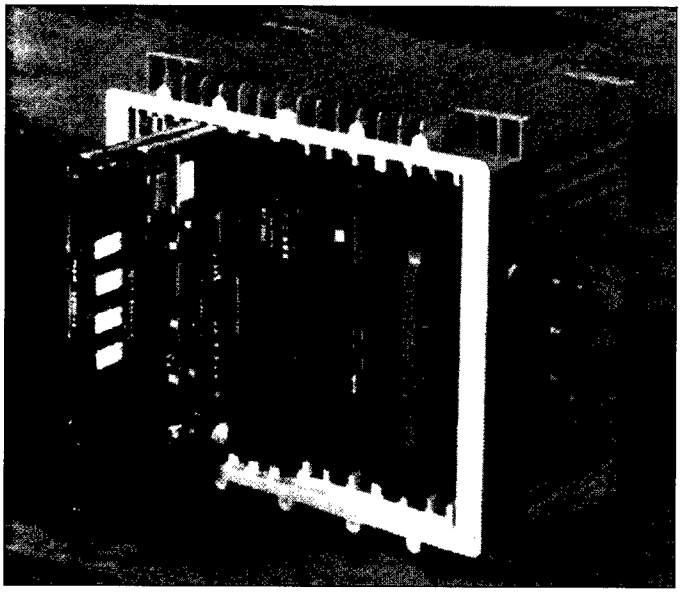
The Advanced Gunnery Training System (AGTS) program has implemented a government-industry Integrated Product Development Team (PDT) process that has received excellent reviews from the ISO 9000 Audit board. Problem solving openness within the PDTs is indispensable to the program's continuing success. Team structure foundation is based upon the Prime Item Development (PID) specification. The PID is oriented towards testable performance requirements which identify major subsystems. A PDT is created and responsible for eventual integration into the final training system. Each PDT is co-chaired by both government and contractor technical representatives responsible for budget and schedule.

PID requirements ownership is allocated to the PDTs by the System Segment Design Document. PDT requirements define the PDT interfaces. Conflicts are resolved by lead project engineers of the System Engineering Integration Team (SEIT) or by the Program Management Integration Team (PMIT) consisting of the project team managers and contracting officers from both the government and contractor. Note that no new authority is established by the PDT, SEIT or PMIT; the teaming structure merely allows team members to exercise their individual authority in parallel to prevent process development impediments.

Interrelated multiple PDT cross functional support requiring coordination is achieved by industry and government co-chaired working groups accountable for cost, schedule, performance, and supportability goals. Examples include: software, systems integration, testing, life cycle contractor support, publications, configuration management, safety, MANPRINT and human



The MILES 2000 Small Arms Transmitter is indicative of the reduction of component size in comparison to the basic MILES.



The Improved Target Acquisition System is a success story in embedding training capability in a tactical weapon system.

factors engineering.

STRICOM's search for continual improvement in business operations led to the best value procurement philosophy. Contract award is based upon a combination of factors necessary for a successful procurement instead of cost alone. PM TRADE's AGTS program applied this new Request For Proposal (RFP) developmental process resulting in lessons learned being briefed for Roadshow II. The Roadshow initiative is an annual AMC acquisition reform workshop series that visits industry and major Army commands.

Streamlining allowed the government AGTS matrix team to release a best value RFP in the *Commerce Business Daily* within 90 days of requirements submission to PM TRADE. The RFP solution combined into one common design, four different vehicle system development efforts, thus sharing nonrecurring design costs. RFP basic functional requirements and information provided by subject matter experts was combined into a "Systems Requirements Document" instead of a formal performance specification.

RFP streamlining emphasis on commercial components allowed contractor freedom in proposing designs unfettered by government specifications and standards. Each offeror's RFP response was formatted as a specification and the proposed system design approaches reflected the use of commercial item and practices as well as pre-existing data for the developmental design processes. Cost reduction was achieved by the creation of a technical library on an electronic bulletin board available for industry review and reproduction.

Testing has always been an area fraught with challenges. The AGTS program implemented a continuous series of "test and inspect" via incremental physical configuration audits throughout the development cycle. Early deficiency identification and resolution creates cost avoidance opportunities. An opportunity for testing improvement was realized by the SEIT tailoring the USAF SIMTEST 2000 test philosophy advocating functional level testing over redundant multi-layered testing. Each PDT was responsible for product unit level testing that met functionality requirements and documentation of test results. Thus, multiple level testing evolved into a two-tiered process of PDT level and systems level testing. Twin bonuses realized are system-level testing requiring shorter test procedures and reduced schedule risk. Many problems are resolved prior to test by PDT interaction.

The AGTS program team activities support PM TRADE's goal of efficiently providing timely, effective, and reasonably priced training equipment to the soldier. The AGTS acquisition team PDTs have implemented FAR 1-102 which calls for an integrated partnership with industry. This integrated approach promotes an understanding of cost versus performance issues and focuses on essential program objectives. The AGTS program, initiated before most DOD reform initiatives, uses the PDT process to eliminate most non-essential MIL-SPECs, documentation, and testing. This enables significant program cost avoidance without compromise in performance or supportability. Use of option year variable quantities on a single contract allowed common development of training devices supporting four unique vehicle systems for three different national governments. This has simplified program administration and promoted synergistic results from commonality.

MILES 2000

The next program briefed was the joint U.S. Army/U.S. Marine Corps MILES 2000 procurement potentially valued at $500 million. This contract was awarded in May 1995 after a full and open competition using "best value" source selection methods. The MILES 2000 system uses eye safe lasers mounted on combat vehicle systems and on dismounted infantry weapons to simulate weapon system operational effects in force-on-force tactical engagements.

MILES 2000 develops new/upgraded weapons simulation capabilities, training effectiveness technology enhancements and is downwardly compatible with basic MILES. It is important to note that basic MILES is rapidly reaching the end of its viable technological and economic life. MILES 2000 ownership costs for the U.S. Army and U.S. Marine Corps were reduced through a joint procurement program ratified by a Memorandum of Agreement between PM TRADE and Marine Corps Systems Command (MARCORSYSCOM). Benefits of this approach include reduced costs for engineering, contracting, configuration management, and logistical life cycle support. A common baseline adapted to service unique requirements results in a lower cost per item. A primary user training benefit is enhanced joint training capability.

The MILES 2000 contract solicitation implemented many DOD acquisition reform initiatives focused on quality in requirements definition, detailed market investigation, industry draft review, and tailored performance specifications and standards. Program requirements were developed using multiple sources comprising the IPT, including the Training and Doctrine Command, MARCORSYSCOM, Service school representatives, the materiel developer, the testing community, and system program managers. These draft requirements were made available to industry on STRICOM's Electronic Bulletin Board for suggested improvements into the draft requirements. These resulted in a clear and concise requirements document that left latitude for industry innovation and enhanced visibility, allowing industry development of technical approaches before publication of the actual solicitation appearance.

PM TRADE conducted a detailed market investigation prior to acquisition strategy development. Could the MILES 2000 requirement be satisfied by adaptation of existing products or was additional development required? Investigation results revealed no existing devices available. However, most requirements could be satisfied by existing technology adaptation and an acquisition strategy based upon a fixed-price production contract.

Once government requirements were determined, the issue became how to best tailor the program for maximum effectiveness. Several approaches were used: tailored performance specifications, non-governmental standards usage, concurrent testing, and expanded use of commercial products and processes. Performance specification tailoring was limited only by user prescribed absolute requirements (example: pre-existing MILES compatibility) thus allowing compet-

ing contractors full opportunity to be innovative utilizing technology advances. Tangible results are reduced acquisition and support costs, lighter and less bulky infantry systems, and increased training flexibility.

Military specifications and standards were reduced, retaining only those required for safety and those without commercial equivalent. The IPT, using the STRICOM Electronic Bulletin Board, requested the contractors to recommend further reductions after RFP release and proposal receipt by the government. Testing duplication was reduced by close coordination by materiel developer and operational tester, as well as by extensive government observation and verification utilizing contractor technical testing. These actions will result in an estimated cost avoidance of $1.5 million.

The IPT decided to formally communicate program intent to industry via a Pre-Solicitation Conference. Both public and contractor confidential sessions, designed to protect proprietary approaches, were conducted which allowed complete disclosure of government intent.

Finally, to reduce risk and provide contractor incentives, a basic contract with four production options was awarded. The basic contract was designed to ensure production baseline adaptations, testing, and logistics support package preparation were successfully completed before the large scale production options are contractually executed. Production options are range priced to provide funding and quantities fluctuation flexibility.

Close MILES 2000 contract management for envisioned objectives results in improved soldier and U.S. Marine training. The successful offeror had to propose a system that met the refined requirements and provided enhanced training value. The winning system is significantly less cumbersome and more transparent to the soldier. It offers significantly enhanced system flexibility and improved simplicity of use and installation. An additional feature from MILES 2000 is a dramatic reduction in life-cycle costs, primarily in the area of battery usage. Utilizing battery sleep modes and rechargeable vehicle batteries, standard off-the-shelf lithium batteries and decreasing the system battery requirements, the overall optempo savings associated with operating MILES will be in excess of $7.6 million annually at its end-state scheduled for 2007.

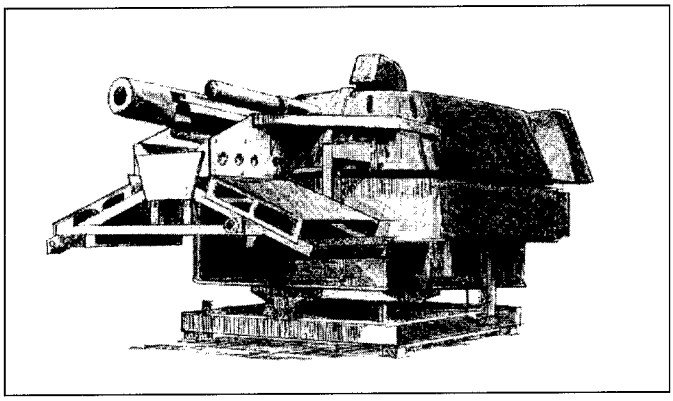
The first unit scheduled for MILES 2000 fielding is Fort Stewart. Savings in batteries will be in excess of $500,000 annually for this installation alone.

Improved Target Acquisition System

The Improved Target Acquisition System (ITAS) for the TOW Missile system is the first tactical missile system to utilize fully Embedded Training (ET). Every tactical ITAS that is produced and fielded will have ET. In the ITAS program, the government realized benefits from several acquisition reform initiatives. These include using IPTs, life cycle schedule reduction by 50 percent, reduced cost of ownership, and contract management for end results.

PM TRADE established and nurtured early strong working level relationships between the tactical weapon system contractor and the training device contractor. The IPT philosophy was also used to coordinate activities between several government agencies, including MICOM, U.S. Army Information Systems Command, the TRADOC Systems Manager, Army Materiel Systems Analysis Activity, the Test and Experimentation Command, and PM TRADE. ITAS program life cycle time was reduced by PM TRADE being an early team player on the tactical weapon development team. Maximum leverage of existing TOW simulation firmware was used. The concurrent development of the ET capability, an integral part of the tactical weapon system testing, correspondingly reduced the program schedule.

A substantial cost avoidance opportunity is created by preventing potentially independent training devices and weapons system developmental efforts. More important is the prominent weapons system life cycle cost avoidance associated with the use of ET to maintain gunnery skills. For example, the approximately $17,000 per missile was made available for other Defense needs by use of ET. PM-TRADE, in managing the ITAS, is focused on the end result provided to the Army with soldiers able to train gunnery skills while deployed forward without the logistics burden of peripheral or externally appended equipment.



The Fire Support Combined Arms Tactical Trainer is the Army's only designated Defense Acquisition Pilot Program.

Fire Support Combined Arms Tactical Trainer

The Fire Support Combined Arms Tactical Trainer (FSCATT) Phase One Program, which was discussed in MAJ Mark Rider's article in the May-June 1996 issue of *Army RD&A*, was also reviewed as the Army's only designated Defense Acquisition Pilot Program (DAPP). Summarized FSCATT acquisition reform highlights briefed include IPT empowerment, use of performance specifications/non-government standards, best value Fixed Price Award Fee contracting, and cost avoidance opportunities including prospective milestone billing, resulting in measurable improvements in cost, schedule and performance.

Summary

In summary, PM TRADE takes great pride in it's use of acquisition reform initiatives. These initiatives enable PM TRADE to move quickly and to field cost effective training systems which support the soldier. As a constant reminder of the fact that it is the soldier's needs that must first be served, PM TRADE adopted as its motto the slogan "To the soldier." The four programs reviewed in this article place particular emphasis on the use of IPTs, best value contracting, performance specifications, modeling and simulation and cost as a independent variable. The accomplishments detailed in this article are a credit to the innovation and hard work of the project directors, engineers, contracting and logistics personnel of PM TRADE and STRICOM. It is through their continued professional efforts that PM TRADE is confident of continued success as the leader in providing training devices to the soldier.

MAJ MARK A. DANISON, a former member of the Army Acquisition Corps, retired from active service in Aug. 1996. He has an M.B.A. and an M.S. from Florida Institute of Technology, a B.A. from Georgia State University, and is a graduate of the Army Command and General Staff College. This article was written in collaboration with COL Noble T. Johnson, MAJ Mark Rider, Ken Lewis, Michael Sims, and Darryl Williams. All article inquiries should be directed to Dave Manning: Phone (407)384-5100.

A STRATEGY FOR COOPERATIVE R&D WITH CANADA

By LTC Ronald M. Janowski

Editor's Note: *This is the second of two articles by LTC Janowski on cooperative R&D with Canada. The first was published in the March-April 1997 issue of Army RD&A.*

The Landscape Of U.S./Canada R&D

Many tools have grown over the years to effect U.S./Canadian cooperation. The Army Materiel Command's (AMC) on-site representative, the standardization officer (STANREP), must achieve an all-encompassing view of the mission at hand to know which tools work, which tools don't, and where new tools are needed. This condition has necessarily led to the development of "The 'Landscape' of U.S./Canada R&D" (Figure 1).

The landscape traces, from left to right, a graduated scale of increasing cooperative involvement. Awareness leads to data exchange and, progressively, to joint efforts. Nearly every cooperative venture subjectively falls within one of these groups, and the result successfully frames the overall challenge of the job. One should not assume that cooperative R&D is like a huge game of "Chutes and Ladders;" there is no set starting or end point. Cooperation may occur anywhere on the landscape and may or may not progress to other levels.

Most of the tools or programs shown are common to the many countries with whom the U.S. Army has ties. A smaller number of the programs are unique to U.S./Canada cooperation. Every program shown is a valued part of the complete cooperative mosaic. But while every title on the landscape is meaningful, experience has shown each to have unique return-on-investment value; this in turn drives the proactive strategy of the office today.

U.S./Canadian Cooperative R&D Strategy

This office strives to maximize a profit of U.S./Canadian cooperative success for effort spent. Accordingly, this office now focuses on four major strategy thrusts (and a handful of other initiatives) to facilitate U.S./Canadian cooperative R&D. (See Figure 2.)

• ***The Technical Cooperative Program (TTCP).*** The TTCP is closely aligned with the America-Britain-Canada-Australia standardization program, and the member nations are the same for both. TTCP permits free and open discussion among members on virtually any non-nuclear research topic. A recently signed agreement even permits the passing of equipment with the passing of information. It is extremely popular and operates wholly autonomously. It is, how-

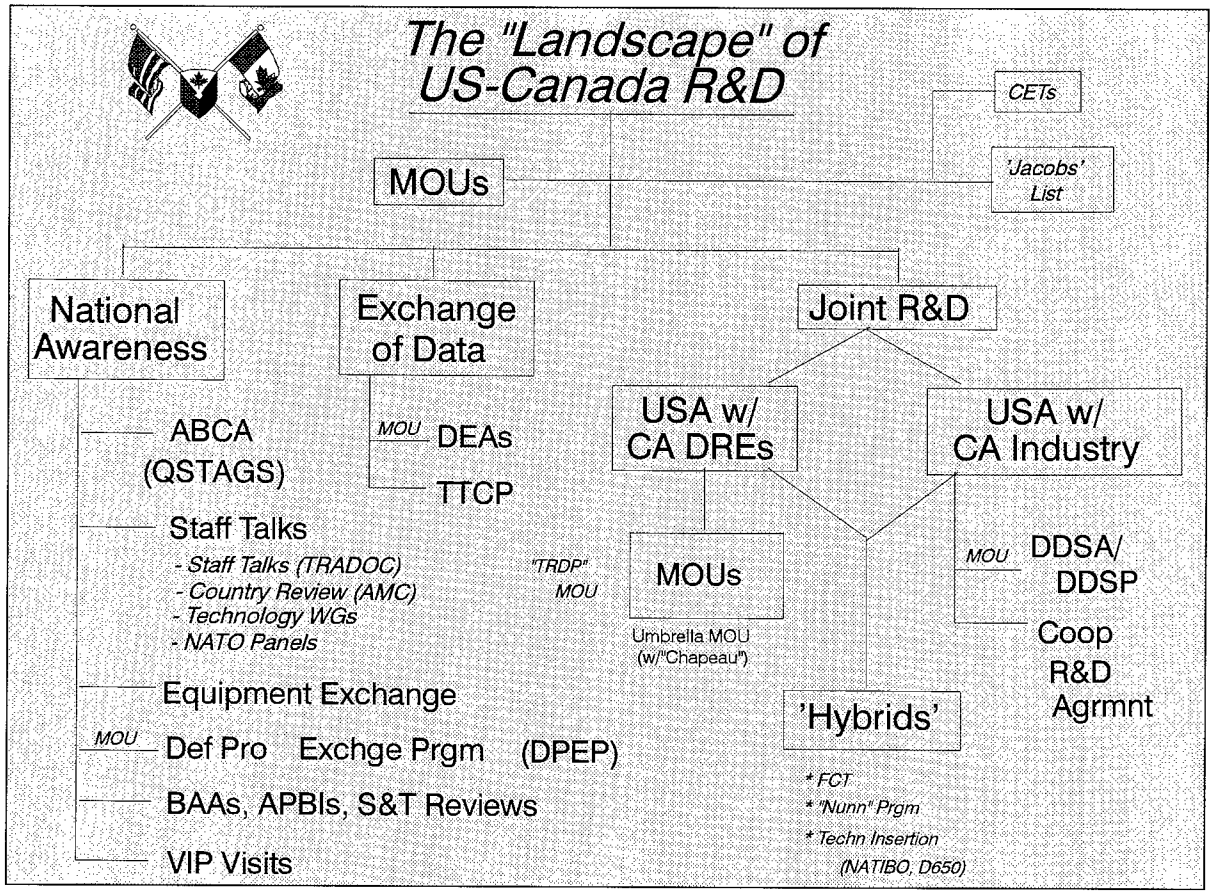


Figure 1.

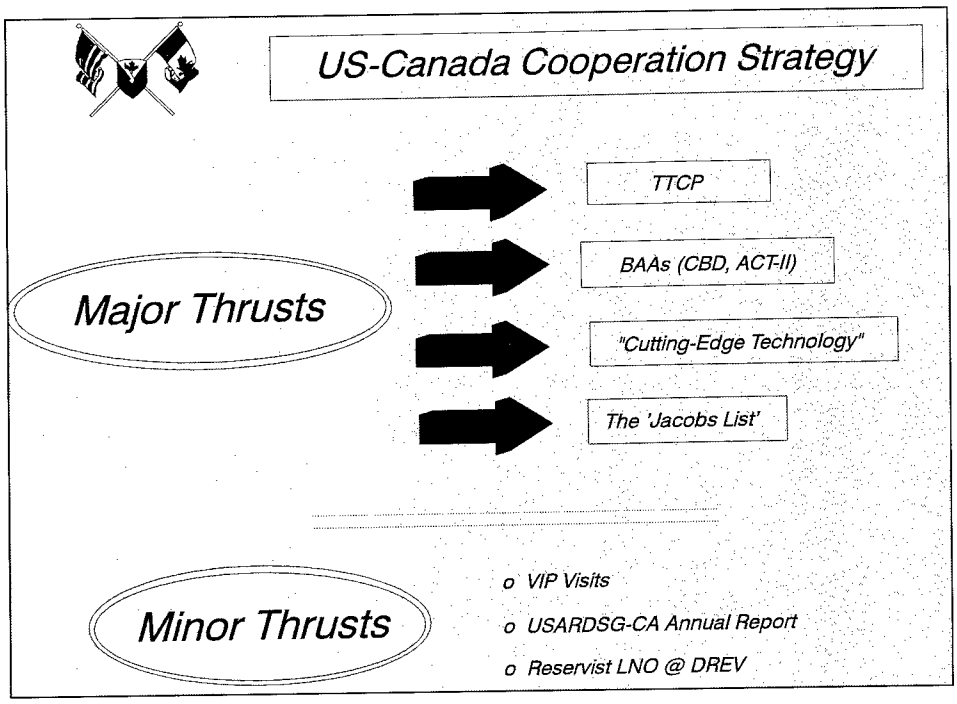


Figure 2.

ever, the most consistently successful and longest running means by which the United States and Canada keep in touch and air possible cooperative projects.

• ***Broad Agency Announcements (BAA).*** The BAAs are common means of publicizing R&D opportunities by the United States. BAAs appear in the *Commerce Business Daily* (CBD), and are put out by the Army Research Office (ARO). In both cases, the opportunities literally cover the spectrum of Defense Research, and in both cases, the offer comes directly to the potential bidder "on a platter"—one need only respond. Canada actively combs the CBD, and in 1995 Canada became the first foreign country to respond to ARO's Advanced Concepts and Technology II Program BAAs. This year, ARO has approved Canadian play in the FY96-FY97 BAAs, and distribution to Canada occurred in mid-January.

• ***Cutting-Edge Technology (CET).*** Canada has niche technologies of world-class caliber; the trick has always been to both identify them, and conclude their worth to a cooperative venture. A natural result of this office's contact with both U.S. and Canadian defense research agencies is an initial listing of such Canadian technologies—CETs. Although the list currently includes only technologies found at Defense Research Establishments (DREs), it is certain that CETs also exist in the commercial sector and will appear on future CET lists.

• ***The "Jacobs" List.*** In September 1995, Dr. Paul Jacobs of the Missile Research Development and Engineering Center (MRDEC) offered to provide Canada a list of MRDEC technologies to which MRDEC would welcome either improvements or solutions. Ensuing discussion honed this offer to any Canadian technology that might be BETTER in performance, FASTER to acquire, and/or CHEAPER in overall system cost (performance/schedule/cost) than any currently known technology. Seizing upon this concept, this office has now made the Jacobs List a major force in surfacing potential U.S./Canadian cooperative projects (Figure 3). Upon receipt, this office broadly distributes the list among Canadian Defense materiel agencies. The agencies then match known Canadian technologies against the list; these matches form the basis of U.S./Canadian discussion and, ultimately, cooperative projects. Currently, Jacobs List submissions from six RDECs are in circulation in Canada. In May 1996, AMC directed that the scope of the concept be expanded for worldwide use.

Other Initiatives

• ***VIP Visits.*** Visits by high-ranking Defense individuals both raise the visibility of the mission and lend credence to the effort. VIPs to Canada in 1995-96 have included GEN Leon E. Salomon (then Commanding General, AMC); the Under Secretary of Defense for Acquisition and Technology; the AMC Principal Deputy for Technology; the Deputy Chief of Staff for Training, U.S. Army Training and Doctrine Command; the Director, Army Digitization Office; and the CG, CECOM.

• ***Annual Report.*** Awareness of opportunities is one of the biggest hurdles to the mission. Publication of an annual report that outlines the mission and the achievements effectively gets the word out and strengthens the idea of R&D cooperation in both countries.

• ***DRE Liaison at Valcartier, Canada.*** In a unique opportunity last year, a U.S. Army Reservist served at a key DRE site for his three-week active training period. His presence greatly aided in on-site observations and mission credence.

The common thread throughout AMC's Canadian strategy is the freedom for Canada to pursue cooperation at her own pace. Each of the initiatives provide Canada an overlapping series of windows into U.S. Army R&D. In no case does a high pressure sales approach come into play; it is, in effect, the Home-Shopping Network of international cooperation. That fact is key to the success of this office. Both countries are struggling to establish their Defense R&D programs under difficult political and economic conditions. In addition, despite the long-time close political, economic, and social ties between the United States and Canada, there are only certain niche technologies in which crucial factors will align (U.S. need, Canadian capability, and timing), allowing significant cooperation to occur. This 'laissez-faire' strategy permits Canada to seize the opportunities as they wish, and as they are able.

The Future

Canada faces a tough ride through the end of this century. Struggles with economy, political questions of where they fit in the post-Cold War world, perceived ruptures of the public trust, and the specter of national fracture will often overshadow the basic subject of national Defense in the public's eye. Nevertheless, Canada will not abandon her historically strong support of worldwide peacekeeping missions, nor will she cease to be America's largest single trading partner, averaging just under $100 billion in overall U.S. exports annually. As Canada replaces her military hardware over time, she will probably standardize equipment with the United States, her most likely partner in any future joint military action. Cooperative R&D projects with the United States may likewise offer Canada opportunities to help fix the economic and political woes facing the country, while concurrently driving improved cooperation. Canadian development of dual-use technologies in support of, or in cooperation with the United States will infuse much needed dollars into their economy.

U.S./Canadian cooperative R&D will likely expand in the future, both in light of U.S. operations in Bosnia and as a result of renewed Canadian funding of the Defense Development Sharing Program (DDSP). Canada and Canadian researchers have extensive first-hand experience in the Bosnian peacekeeping role, and cooperation between the countries is ongoing. If such cooperation surfaces likely projects, Canada

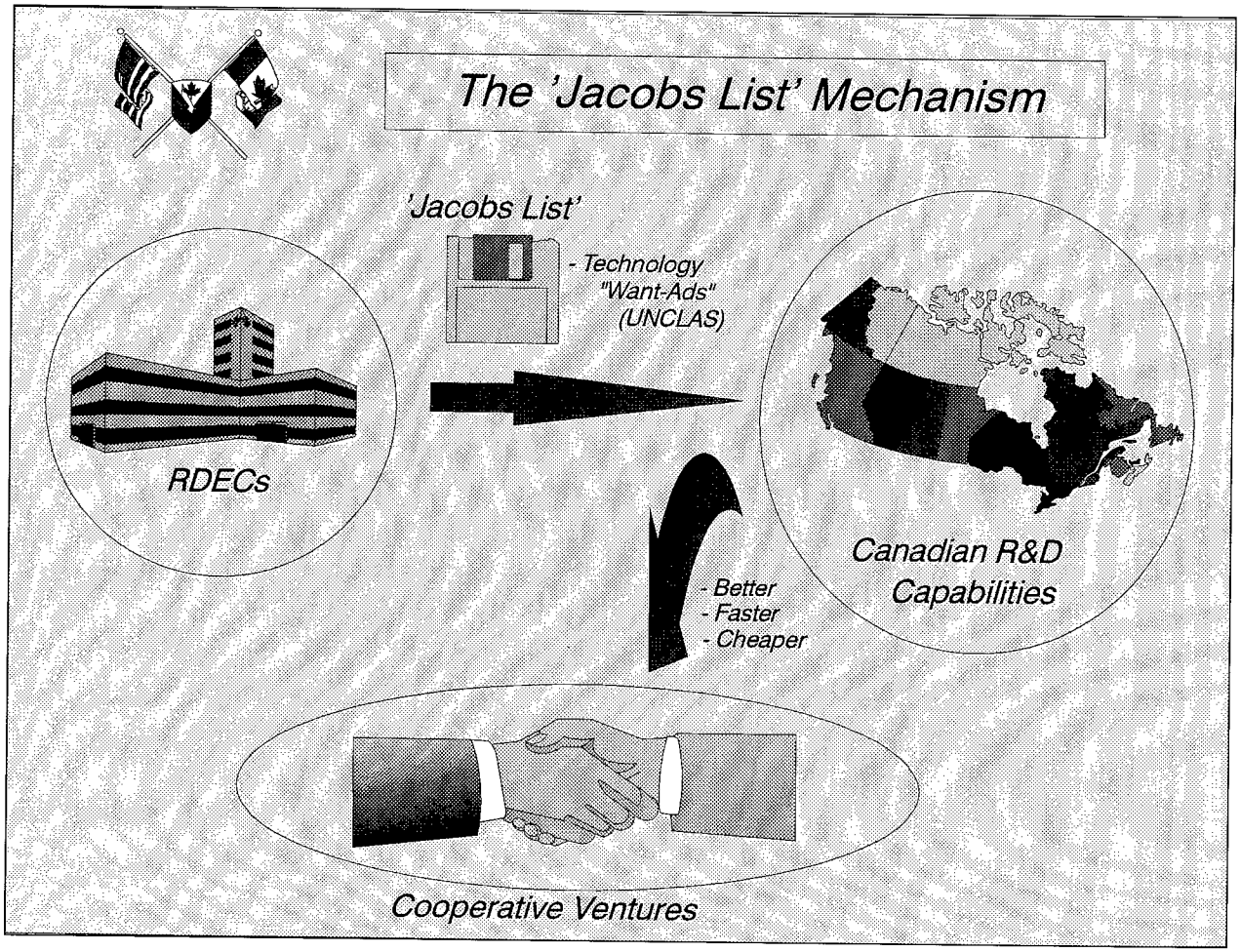


Figure 3.

will certainly support establishment of a DDSP.

Both the TTCP and the recently initiated Jacobs List mechanism will continue to provide means for discussion and possible cooperation. Canadian interest, participation, and possible mimicking of the Battle Labs is likely to generate cooperative developments, not only in materiel processes, but also those of doctrine, training, and organization. Finally, the expanding participation of Canadian academic institutions in U.S. research programs, an effort in its earliest stages by the Army Research Office, will further encourage Canadian activity in the early stages of U.S. acquisition cycles.

The Bottom Line

This office is improving cooperative R&D with Canada. It has, and continues to review the needs and capabilities of both countries. In doing so, it has achieved an inside view of the political/economic conditions that shape the long-running and largely inter-meshed U.S./Canadian partnership. The result is a proactive and tailored strategy that clearly defines U.S. Army needs, while affording Canada a flexible response to cooperative possibilities. It is a practical approach that is showing success.

Of special note, the success of this office is largely a measure of classic matrix organization management. In the course of day-to-day operations, the office commands skilled and knowledgeable members throughout the Army's acquisition community. Likewise, this office freely offers itself to become an extended staff to several Army agencies in the pursuit of improved international cooperation.

This office is a rarity—a podium of broad latitude engaging matters that demand equal balance in both technology and politics. There is no doubt that the Army's cooperation with each liaised country is the better for the presence of these organizations. But success depends on the Defense agencies of all allied nations acknowledging the value of, and sincerely pursuing, international cooperative R&D.

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RAH-66 COMANCHE HARDWARE AND SOFTWARE PROCESSING ARCHITECTURE

By Doug Madigan, Juanita Harris, Jeff Grover and Jim Grover

The 1989 Defense Acquisition Board (DAB) decision to compete a Light Helicopter Experimental (LHX) program for the development and procurement of a 7,500 pound and $7.5M (fly away cost in 1988 dollars) rotorcraft required consideration of many advanced technology concepts. With the weight and cost mandates established by the DAB, it was imperative to explore new ways to consolidate large amounts of functionality into smaller packaging. Accompanying that thrust was a congressionally-mandated requirement to establish a common avionics baseline for use on the LHX, the Air Force Advanced Tactical Fighter (now the F-22), and the Navy Advanced Tactical Aircraft (A-12, which was canceled long ago). In addition, a newly established DOD mandate required the use of the Ada High Order Language for LHX software. Other key contributors to the LHX design direction were the survivability and reliability requirements established in the Army's LHX Operational Requirements Document (ORD).

Based upon this combination of influences, the Army, through the LHX Program Office, became a key player in the Joint Integrated Avionics Working Group (JIAWG). The JIAWG's focus was to develop a set of standards and specifications for an integrated avionics suite. Hardware specifications were based on a form, fit, function, and interface (F3I) approach, rather than the traditional build-to-print approach. The JIAWG brought together government engineers and managers from the three Services, as well as their counterparts from the LHX and ATF competing contractor teams, and the already selected A-12 contractor team. The knowledge and ideas shared among this diverse group were wide-ranging and at the leading edge of technology. The concepts of shared processing resources and graceful degradation of functionality to accommodate lost processing resources were integral to the JIAWG's advanced avionics architecture standard. Both LHX competing teams submitted this approach in their proposals. With the selection of Boeing Sikorsky in April 1991, the real LHX (now called the LH) design process began.

Key elements in the ensuing design process were the selection of a processor, backplane buses, and an interface bus. The JIAWG influence was large in these areas. The LH, along with the ATF (the A-12, now canceled) was chosen to use the Intel i80960 CPU, the Parallel Interface Bus (PI-Bus) and the Test and Maintenance Bus (TM-Bus) as backplane buses, and the High Speed Data Bus (HSDB) as an interface bus to be the core of their respective avionics architectures.

As the LH, now RAH-66 Comanche, progressed in its avionics architecture design, a key element to meet cost, weight, and performance requirements became the software and hardware processing architecture. The hardware included two Mission Computer Clusters (MCCs), each comprised of Standard Electronic Module - Format E (SEM-E) line replaceable modules. This approach is a key element of the Comanche's two-level maintenance concept—removing and replacing at the unit level, or performing depot-level repair. Intermediate-level maintenance is eliminated.

The two MCCs exchange information as needed via the HSDB. Within the MCCs, various SEM-E modules are connected by the backplane buses—the PI-Bus for control and data exchange, and the TM-Bus for maintenance/fault information passing. The key processing assets within the MCCs are the Data Processor Modules (DPMs) and the Array Processor modules (APs).

The APs provide the signal processing power required to handle the Comanche sensor imagery and the Aided Target Detection/Classification algorithms. The DPMs host the i80960 CPUs for general purpose processing, as well as Non-Volatile Memory (NVM) to store software programs.

Other key processing assets in the MCCs are the Graphics Module (GM) and the Video Distribution Module - Transmit (VDM-T) which together make up the Comanche Display Generation System (DGS) and the Fiber Optic Data Bus modules (FODBs) which are the MCC's interface to the HSDB. Figure 1 depicts the Comanche hardware processing assets.

The software that runs in the Comanche MCCs is the Comanche Mission Equipment Package (MEP) Operational Flight Program (OFP). It consists of Computer Software

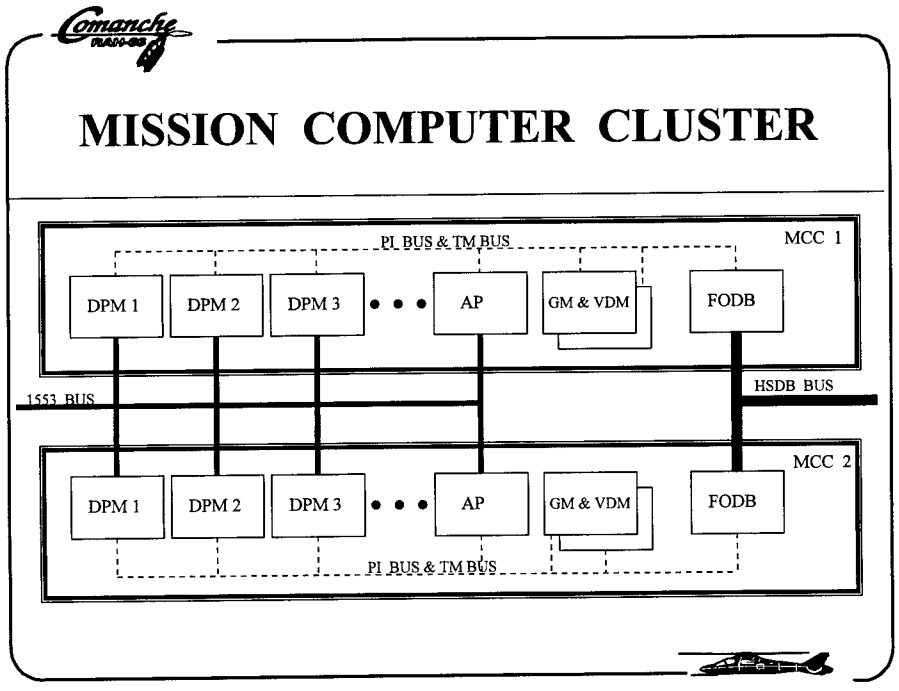

Figure 1.

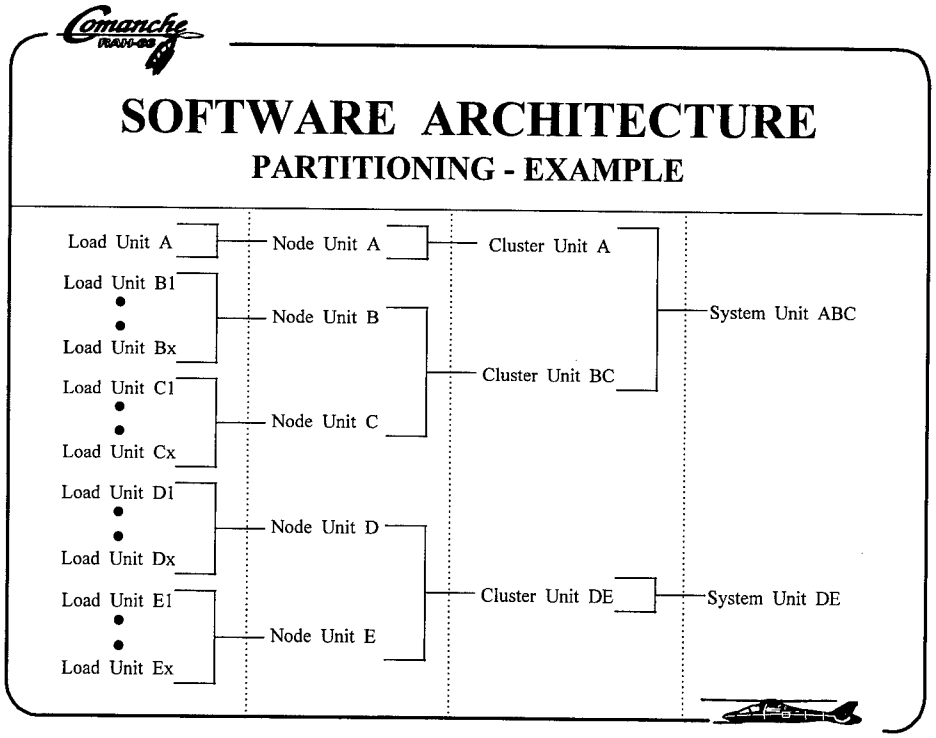

Figure 2.

Configuration Items (CSCIs) developed by Boeing Product Support Division in Wichita, KS; Boeing Helicopters in Philadelphia, PA; Sikorsky Aircraft in Trumbull, CT; Northrop-Grumman in Baltimore, MD; Lockheed Martin in Orlando, FL; and Harris in Melbourne, FL, to name the major players. These CSCIs must be integrated to create the OFP and loaded to the DPMs to provide Comanche MEP OFP functionality.

The Mission Equipment Package and the overall system architecture, including the DPMs and the Comanche MEP OFP software, will enable the Comanche to meet the requirements in the ORD for fault/damage tolerant avionics. Within the Comanche system specification, there are specific requirements for graceful degradation and fault tolerance. The design to meet the requirements was partitioned between a software architecture and a hardware architecture. The hardware architecture, involving the DPMs and buses described above, includes the use of installed spare modules and additional empty, but wired, module slots within each MCC.

The Comanche MEP software architecture is the heart of the Comanche weapon system. The architecture approach builds software from units (Computer Software Units - CSUs) to components (Computer Software Components - CSCs). However, from that point on, the Comanche software development process and the actual software architecture are quite unique. Because of the fault/damage tolerance requirements and the complexity of the software functionality, coupled with the many software developers involved on the Comanche program, a unique software architecture and unique integration processes are required.

The major functional elements of the Comanche OFP are System Units (SU) providing capabilities such as aircraft systems management, pilot vehicle interface, etc. The effective integration of these SUs to form a comprehensive Comanche MEP OFP satisfying the graceful degradation and reconfiguration requirements has posed a significant challenge given the helicopter space, weight, and power constraints. Satisfying the specified requirements, without introducing undue overhead or demanding excessive resources, drove designers toward adoption of a modular building block approach.

System developers have adopted an innovative architecture of interrelated software-based components which operate to provide OFP specified functionality. This approach supports three program objectives: an orderly development process; efficient use of available processing resources; and functional reconfiguration during operation should some hardware become unavailable.

The OFP software architecture is based on functional units called load units, node units, cluster units, and system units. The objective of this architecture is to define software units that are constrained to reside at a given level within the architecture to support flexible software load. Here is how the software architecture is structured:

LOAD UNIT (LU): A LU is the lowest level of software unit and the building block of the system. A LU contains one Ada program (an Ada program consists of at least one Ada task, the main task). A LU is designed to tolerate movement to a different DPM at any point during execution; it is also designed to tolerate communications partners being moved to a different DPM or removed from the system entirely without undesirable effects. A CSCI consists of one or more LUs.

NODE UNIT (NU): A NU is the next level above a LU. A NU is one or more LUs configured to reside on the same DPM (node) in the system; communications between LUs on the same node is guaranteed to be intraprocessor. Only one copy of a NU is loaded per MCC but there may be a second copy in the other MCC. NUs may be shared by higher level software units.

CLUSTER UNIT (CU): A CU is the next higher level above a NU. One or more NUs are configured to reside within the same MCC. This ensures communications between the LUs and the NUs will not be required across the HSDB. Only one copy of a CU is loaded in the Comanche processing architecture. CUs may be shared by higher level software units.

SYSTEM UNIT (SU): A SU is the highest level software unit. It is one or more CUs and ultimately a collection of Ada programs (LUs). A SU implements the software portions of a mission capability and represents that functionality within the MCC.

A partitioning example is shown in Figure 2.

Comanche software in the OFP is partitioned along functional lines such that all the functionality that collectively forms a unique system capability can be grouped together and prioritized in terms of mission performance. The Comanche OFP software supports graceful degradation because of the partitioning concept of the SUs. The Comanche avionics (the MEP) can operate in a degraded mode whenever resources are lost. A resource could be a sensor or a DPM within an MCC. When a sensor is lost, it may be desirable for a different SU to be loaded which either more closely matches the remaining available sensors or implements a backup capability. When a DPM is lost, there may be insufficient resources to load all the originally requested SUs. Also, a SU may be a super set of the functionality that would be required in a degraded mode.

The OFP integrator is Boeing Helicopters. Software components are developed and tested as much as possible by the individual developers. Level 1 integration is conducted internally by all CSCIs; Level 1.5 integration (which has the same objectives as Level 2 integration) is conducted at Sikorsky Aircraft and integrates the Sikorsky Crew Interface Management (CIM) software and the Aircraft System Management (ASM) software along with the LHTEC Airborne Engine Monitoring System (AEMS) software and the Boeing Wichita Operating System (OS) software; Level 2 integration is conducted at Boeing Helicopters and incorporates the Sikorsky software, the LHTEC software, the Boeing Wichita OS software and

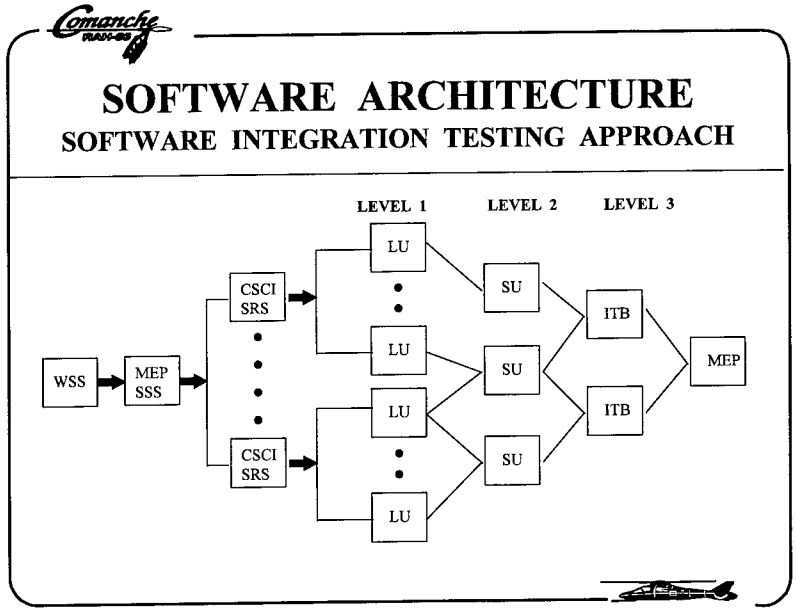

Figure 3.

the Boeing Helicopters Mission Management and Control (MMC) CSCI.

Overall OFP integration (Level 3 integration) occurs at Boeing Helicopters. OFP integration testing is accomplished at Boeing Helicopters, including the Prototype System Integration Test (PSIT) required prior to delivery of the OFP to flight test.

Not all software requirements testing must be done by the developers. Many LU functions require an interface to other LUs in order to execute. Thus, some software requirements testing can be incorporated in Level 1, Level 2, and Level 3 integration activities, as well as in PSIT. The location and scope of the testing is agreed upon by the government and the contractor as part of the OFP software Integrated Product Team (IPT) development approach. IPT development is used throughout all aspects of the Comanche program. Further clarification of the software integration and test process follows:

Level 1: Level 1 is the integration of the LUs within a single CSCI and is the responsibility of the CSCI design team. The objectives of Level 1 integration are to verify LU to LU messages within a CSCI; to verify interfaces to the OS CSCI application services; to verify external CSCI interfaces using stubs and drivers; and to verify external hardware interfaces using simulated and/or actual hardware.

Level 2 (Level 1.5 has same objectives): Level 2 is the integration of LUs that cross CSCI boundaries by incrementally building up the Comanche OFP and is the responsibility of the Boeing Helicopters integration team. The objectives of Level 2 integration are to verify LU to LU messages between CSCIs; to verify end-to-end functionality of MEP capabilities; to verify external software interfaces using stubs and drivers; and to verify external hardware interfaces using simulated and/or actual hardware.

Level 3: Level 3 is the integration of the MEP OFP LUs to support full-up and degraded conditions and is the responsibility of the Boeing Helicopters integration team. The objectives of Level 3 integration are to verify dual cockpit functionality; to perform mission oriented integration; to perform stress testing; and to perform hardware to software integration not verified by Level 2 integration, e.g., MEP OFP connection to the Flight Control System Integration Lab (FCSIL). Figure 3 depicts the integration levels described above, as well as the requirements flowdown. Note that the WSS is the Comanche Weapon System Specification (now a Performance Weapon System Specification (PWSS)), the MEP SSS is the MEP Segment System Specification, SRSs are Software Requirements Specifications, and ITBs are Integrated Test Benches.

The Comanche software and hardware processing architecture has many advantages. The software development process has included DOD Std 2167A (used as a guide) testing plus architecture specific processes, i.e., CSU, CSC, and some CSCI testing is performed per 2167A while architecture-specific Level 1, 2, and 3 integration and testing is also being done. A major benefit of this approach is that parallel testing activities can occur. With Comanche's complex MEP requirements and aggressive development schedules, this integration and testing approach is extremely valuable.

Presently, as the Comanche program enters the Early Operational Capability (EOC) phase, reconfiguration is evolving to a more deterministic approach vs. the original design concept of a fully dynamic reconfiguration capability. Testing an OFP with a reconfiguration capability that is based on its functioning in one of multiple predefined operational scenarios is technically achievable and less costly than doing so for the many configurations possible in a fully dynamic reconfiguration concept.

As time and technology have progressed, along with today's drive towards commercialization, the Comanche processor will most likely be changing from a special purpose CPU (the i80960) to one that is commercially available (the Pentium P5). The beauty of the Comanche MCC system architecture is the flexibility it provides to allow for system upgrades without major system modifications. This processor change on the DPMs along with increased NVM should permit a more straightforward reconfiguration approach to be used with no increase in necessary processing assets within the MCCs. Using the load unit, node unit, cluster unit, and system unit approach, as well as the tiered integration and testing approach, would not change the Comanche software architecture.

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COMANCHE'S ENVIRONMENTAL CONTROL SYSTEM

By Frank B. Mokry

The Comanche is the first Army aircraft to integrate a nuclear, biological, chemical collective filtration protection system with an aircraft environmental control system.

Introduction

The RAH-66 Comanche Helicopter is the U.S. Army's latest aircraft development program. The Comanche is a light attack/armed reconnaissance helicopter that will provide superior combat effectiveness and battlefield survivability against current and future threats and will modernize the Army's current light attack/scout helicopter fleet. The Comanche incorporates the latest aircraft technologies to enhance its performance capabilities in high, hot altitude environments and in air combat.

The Comanche, like any other fixed or rotary wing aircraft developmental program, must deal with cost, schedule, weight, performance, and space constraints. Each major system and subsystem on the aircraft must meet all design and program requirements within these constraints.

The Comanche's Environmental Control System (ECS) has incorporated some new and innovative design concepts to meet its operational and packaging requirements. The Comanche is the first Army aircraft to integrate a nuclear, biological, chemical (NBC) collective filtration protection system with an aircraft ECS. This design concept integrates cockpit and electronic equipment bay overpressure with the ECS and a regenerable NBC filtration system. Developmental challenges have occurred with the regenerable NBC filtration system and hotter than specified ECS supply air. Multiple component redesigns are the result of these challenges. The hotter supply air has required material changes in some components. The redesign of the NBC filters has required a product development team to identify and solve their related performance problems. The Army's own Edgewood Research, Development, Engineering Center (ERDEC) has taken the lead role in the NBC filter's redesign. This article introduces the reader to the Comanche ECS/NBC system, its development status, and some of its development challenges.

System Description

The design goal of the ECS is to provide uncontaminated, conditioned air to the crew cockpit and the aircraft electronics while the ECS is operating. The basic ECS is a bootstrap Air Cycle System that utilizes the Comanche's Secondary Power Unit (SPU) bleed air as the working media to provide conditioned air. (Figures 1 and 2 show locations of component hardware in the aircraft.)

Hamilton Standard provides the ECS portion of the system while Pall Aerospace Corporation provides the NBC filtration components integrated into the ECS and Sikorsky Aircraft provides the design integration of the complete system. The system consists of an upper pack, lower pack, fuselage distribution ducting, and cockpit distribution ducting. The upper pack, located behind the T-800 engines and next to the SPU, consists of a dual primary/secondary heat exchanger, air cycle machine (ACM), temperature control valve, ambient backup fans, and interconnection ducting. The upper pack is removed and replaced as a single unit. The lower pack is located just below the upper pack and consists of a regenerative heat exchanger, cockpit heater, avionics backup cooling valve, recirculation fan, Water Separator Coalescer HEPA (WSCH) filter, PSA filter, distribution manifold assembly, and interconnection ducting.

A built-in test feature is incorporated into the ECS architecture to detect and isolate system component failures (mechanical and electrical), such as:

- Cockpit overpressure;
- Cockpit supply temperature out of range;
- Cockpit/avionics temperature out of range;
- Compressor overtemperature;
- PSA failure; and
- Controller failure.

Backup fans for the cockpit and electronic bays turn on to provide ambient air for cooling in the event that the ECS is not operating. Pressure, temperature, and position switches detect failures in the system. All detected failures are communicated to the crew.

System Operation

Hot SPU bleed air is supplied through a

check valve and then cooled in the primary heat exchanger. This air is then sent to the compressor side of the ACM where the pressure and temperature of the air rises. The heat of compression is removed by the secondary heat exchanger. Both the primary and secondary heat exchangers (dual heat exchanger) are cooled by ambient air supplied by the fan of the ACM. The air then flows through the regenerative heat exchanger where it is cooled and some water condensation occurs. From here, the air enters the NBC filtration system that consists of two filters. The first filter, a water separator, coalescer high efficiency particulate air (WSCH) filter removes any free moisture, particulate, and fine chemical droplets and discharges them overboard. The liquid/particulate free air then enters the regenerative PSA filter where any remaining water or chemical agent vapors are adsorbed then desorbed to be purged overboard through cycling of the two PSA beds. Very dry (-40 F dew point), purified, high pressure air then returns to the ACM where it is expanded and cooled across its turbine to subfreezing temperatures (down to -100 F). This cold low pressure air is then ducted to the electronics equipment bays for cooling.

Portions of the turbine outlet air and the air coming from the equipment bays are mixed and sent to the cockpit for cooling. Cockpit temperatures are maintained at the required temperature by passing the air through the cockpit heat exchanger before entering the cockpit. The cockpit pressure regulator valve maintains cockpit overpressurization of 0.5 psia. The Electronic Optical Sensor System on the nose of the aircraft uses some of the cockpit exhaust air for cooling before being dumped overboard.

Technological Highlights

The Comanche is the first Army aircraft to integrate an NBC filtration system with an environmental control system into its system architecture. Some weight/space saving and new design highlights of the ECS/NBC system and its components are as follows:

• ***The system is optimized for space and weight requirements.*** The total allocated weight of the system is 164 pounds. Minimal size ECS and SPU components are achievable through the incorporation of the PSA filter which removes virtually all water vapor from the system air. The ECS takes advantage of this process to run the extremely low ACM turbine exit temperatures.

• ***The ACM is a state-of-the-art design that uses air bearings for longer life and reliability.*** It has a rotational speed of 85,000 to 90,000 rpm. It is a derivative of the SAAB 2000 turboprop commuter aircraft ACM. The ACM does not need turbine anti-ice capability due to the very low humidity air supplied by the PSA filter.

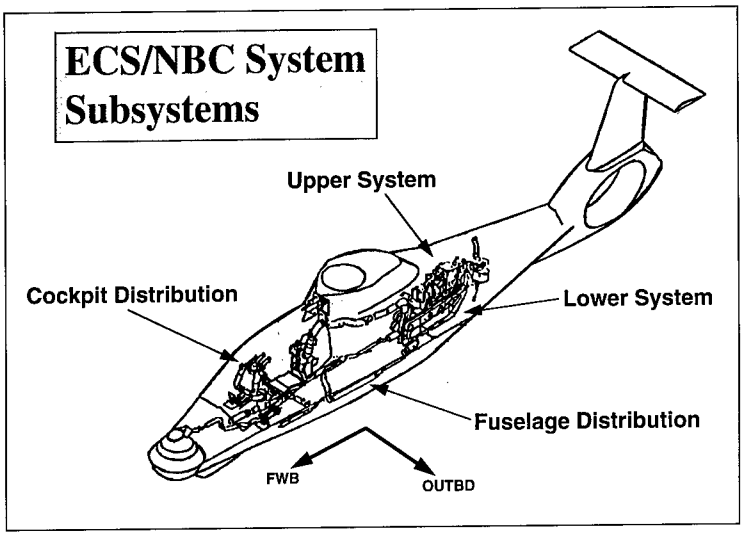

Figure 1. The Comanche Environmental Control System Nuclear, Biological Chemical System.

• ***The system has no need for a bleed air pressure regulator since the SPU operates with a nearly constant bleed air pressure.***

• ***There is no canopy or windshield defog ducting needed in the cockpit due to the very low humidity air and the use of an electrically heated front windshield.***

• ***The system design incorporates a microclimatic cooling system for the crew.*** This system consists of quick disconnect ducting, temperature control, and a cooling vest. The cooling vest is worn by each crew member during extreme hot operational days with or without NBC MOPP IV gear.

• ***The system incorporates a full-time operational regenerable NBC filtration system.*** This system consists of a WSCH and PSA filters. The WSCH removes liquids, aerosols, and solid particles (down to 3 micron level). The HEPA part of this filter is 99.997 percent efficient in removing solid particles. The regenerative PSA filter removes water vapor and gaseous contaminants from the air stream and the PSA purifies and dries the air by using two beds filled with an appropriate adsorbent material. The two beds cycle back and forth between each other in a specified amount of time. While one bed is adsorbing and purifying the feed air at high pressure, the other is regenerating or purging itself of contaminants at low pressure. The second bed utilizes a portion of the purified air as it returns from the cockpit and equipment bays. The flow through the beds is controlled by diaphragm valves that are sequenced open and closed by the PSA controller. The health of the PSA beds is monitored through the use of an inbed capacitance probe which senses the change in water vapor content. The probe, when triggered, indicates that the filter is about to fail. An impending failure of the PSA message is relayed to the crew.

• ***The NBC filtration system carries some inherent risk because an operational PSA has never been used to date on a helicopter or ground vehicles for crew protection or moisture removal for electronics cooling.*** PSA air filtration is presently used in industrial manufacturing facilities to dry air for operations. This technology has matured over the past 40 years.

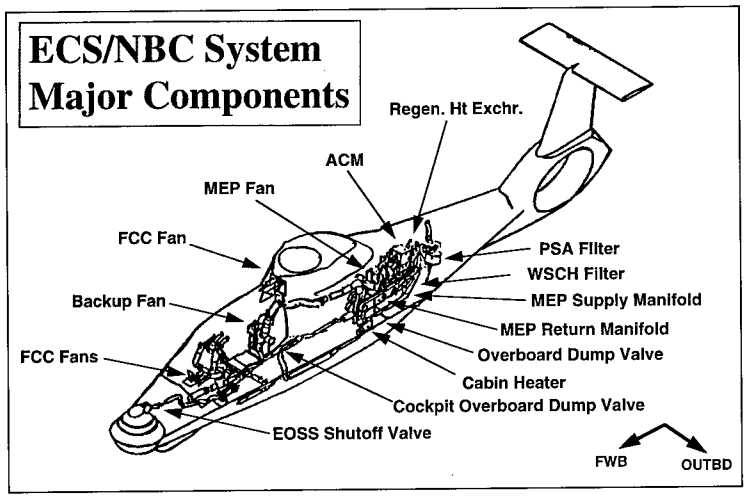

Figure 2. Comanche Environmental Control System Nuclear, Biological, Chemical System location.

The industrial units are very large and do not have to perform under strict space, weight, and performance constraints.

System Development Status

The Comanche ECS has progressed through the demonstration validation (DEM/VAL) development phase of the program. The system and its components have been designed and tested to the level of Safety of Flight. The system and its components are satisfactory to fly on the first prototype aircraft. Further system and component development is needed in the next phase of the program (FY 97 - FY 2001). Full system and component performance qualification will start in FY 2002.

To date, the system has encountered a few development challenges. In particular, the supply bleed air from the SPU is hotter than specified and design/performance issues with the NBC filtration system were encountered.

The hotter SPU bleed air and the poor performance of the NBC filters was first encountered during Safety of Flight testing of the SPU and the ECS in the third quarter of FY95.The hotter SPU bleed air will require a redesign of some ECS components. Poor performance of the WSCH and PSA filters has severely degraded ECS cooling performance and those components will require redesign.

The hotter SPU bleed air was not significant enough to impact the flight testing of the first prototype aircraft in FY 96. The only impact was some ECS component reliability. The performance of the NBC filters did impose impacts to the first prototype aircraft. The PSA filter degraded the aircraft's ECS cooling capabilities. The baseline ECS configuration had to be modified in order to support first flight and the flight test program for the prototype aircraft. More cooling air was taken from the system to increase the regeneration of the PSA beds. The WSCH filter was supplemented with an up stream water separator to help take out the liquid water in the system feed air.

System And Component Redesign

A product development team was formed in October 1995 to address the ECS development issues. The team, designated as Team ECS, consists of members from the Comanche Program Management Office, Aviation Troop Command, ERDEC, Defense Contract Management Command, Sikorsky Aircraft, Hamilton Standard, and Pall Aerospace Corporation. Team ECS's working charter established the following objectives:

- Support the Comanche First Flight and Flight Test Program;
- Identify and examine the current ECS design issues;
- Review and evaluate the current ECS design approach;
- Identify and analyze design improvements to meet the system requirements;
- Consider technical performance, cost, schedule, weight, and risk; and
- Make appropriate recommendations to management.

Team ECS employed the advanced NBC filtration development experience of ERDEC to reassess the maturity and risk of applying the PSA technology to the Comanche ECS application. Since 1991, ERDEC has served as the government PSA technical experts for Comanche. They have invested heavily, approximately $15 million from FY90 to FY95, in understanding PSA operation under the Armored Systems Modernization Program. Their investment was made to fully understand PSA technology and, specifically, to enable them to evaluate contractor proposals for advanced NBC filtration systems on future armored vehicles and other weapon systems.

ERDEC concluded that the PSA technology was applicable to the Comanche ECS performance requirements, but the current PSA would need a redesign. Analysis showed that the present PSA system, designed by Pall Aerospace operating under the current ECS design constraints, would not remove moisture adequately with only minor modifications. They concluded that a new optimized PSA bed configuration was needed to remove moisture and chemical contaminants to the required levels. The redesign was considered low-risk as long as proper PSA modeling, lab scale, breadboard, and full-scale testing was performed.

ERDEC was subsequently tasked to utilize its expertise and resources to redesign the PSA bed. ERDEC possesses the most up-to-date PSA analytical performance model and PSA lab and full-scale systems test data base. A preliminary bed design to remove water vapor only was completed and given to the Comanche Program Management Office on July 3, 1996. This preliminary design consists of a multilayered desiccant bed. A final design that removes water and chemical vapors is due to be completed during 1997 and will be handed over to Sikorsky and Pall Aerospace to incorporate into the PSA filter hardware.

Hamilton Standard will initiate redesign of the primary/secondary heat exchanger, cockpit heat exchanger, and primary diverter valve to address the hotter SPU bleed air temperatures. These changes will incorporate the use of titanium (current design uses aluminum) and an enhanced performance fin for the heat exchangers and steel for the valve. They will also design two new components for the ECS. The first is an air reheater for the PSA supply air to ensure no liquid moisture reaches the PSA and the other is a water separator which will take the liquid water removal function of the WSCH filter. The WSCH filter functions are now being performed by two separate components, a water separator and a HEPA filter.

Pall Aerospace will redesign the PSA hardware to accommodate the new PSA bed designed by ERDEC. This will include the redesign of the feed and purge valves and pressure vessel container. They will also redesign the HEPA filter as a separate component.

Conclusion

An aircraft ECS is often a forgotten, low visibility subsystem until it fails to function properly. Often complex and expensive when utilized, this subsystem can easily account for 10-15 percent of the total air frame cost. The Comanche ECS provides vital uncontaminated, conditioned cold air to the mission equipment, flight control computers, and other electronic components to ensure proper function and reliability under all operational temperature ranges. Most importantly, it provides the same air to the crew to enhance crew performance and survivability for all operational missions.

Comanche is unique to Army aircraft in that it has an integrated ECS/NBC system designed into the architecture of the aircraft. Boeing Sikorsky and its subcontractors have designed the ECS/NBC system with state-of-the-art components to meet the system design requirements and constraints placed on it. The development of the ECS has not been without risk or challenges. In particular, the integration of the NBC filtration system into the ECS has presented some unforeseen challenges. However, the experience and expertise of ERDEC in the PSA filtration area has proven to be of great benefit to the Comanche Program in identifying and solving these challenges.

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THE TACOM, UNITED DEFENSE LIMITED PARTNERSHIP TASK FORCE

By Beatrice Foulds-Stadnika

Introduction

In the 1990s, the Department of Defense began to focus on various methods hypothesized to reduce the acquisition cost of programs. To that end, buzzwords of the 1990s were coined to categorize programs which would reduce costs. Integrated product teams, common processes, common requirements, commercial practices and standards, acquisition reform, acquisition streamlining, alternative disputes resolution, process-oriented contract administration services, single process initiatives, and block change modifications are but a few. These represent a lot of good ideas and programs with the common thrusts of reducing program/acquisition costs and eliminating oversight. MG Edward Andrews, Commanding General, U.S. Army Tank-automotive and Armaments Command (TACOM), and Thomas Rabaut, Chief Executive Officer, United Defense Limited Partnership (UDLP), wove these concepts together in an evolving program of government, contractor and customers.

Partnered Task Force

Formation of the TACOM/UDLP Acquisition Streamlining Task Force began with a grass roots effort originally started in August 1994 by various quality and acquisition folks from both contractor and government. By October 1995, it evolved from one team into a major effort of seven partnership councils with a charter executed by Andrews and Rabaut. This charter espoused the goals of eliminating non-value added requirements, agreeing upon common processes across many different programs, and reducing cost and oversight. (See Figure 1.)

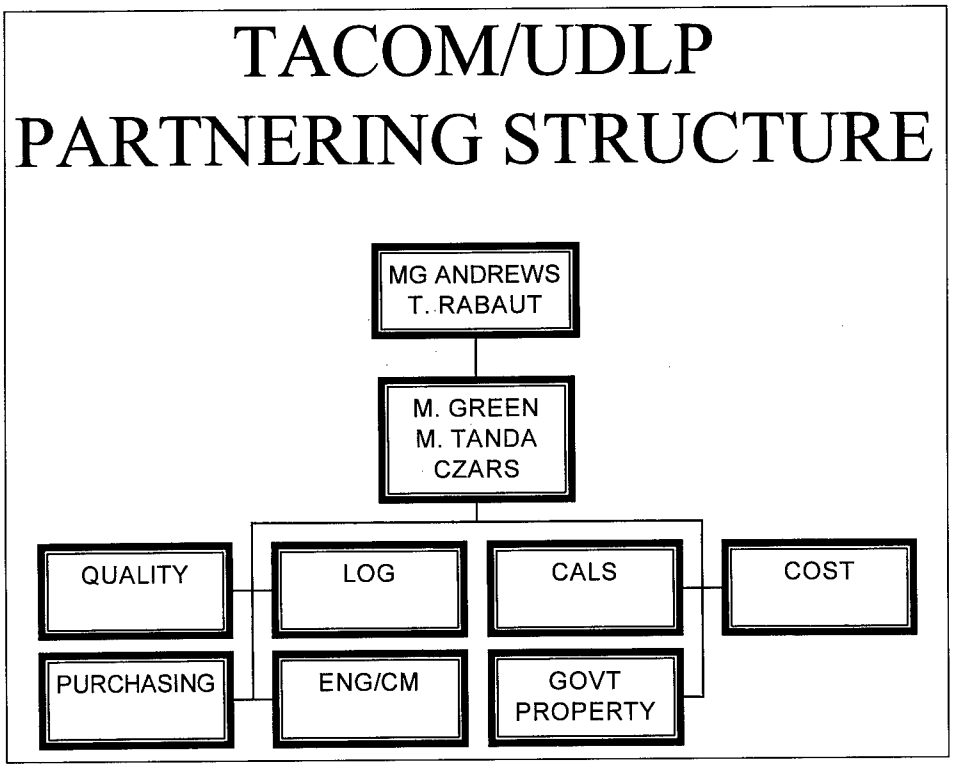

Figure 1.

Andrews and Rabaut directed all sides of the equation to take risks to streamline or eliminate processes in engineering, purchasing/procurement, logistics, financial, quality, or continuous acquisition and life-cycle support to aid survival into the 21st century with affordable programs intact. To assist the councils, Andrews and Rabaut appointed government and UDLP czars to oversee and/or adjudicate the partnering effort. Each council and/or team is empowered to reach consensus on the change and on any resulting savings/cost avoidance. To date, the councils, representing 100 percent of the UDLP Ground Systems Division (GSD) customers, are working on more than 100 initiatives.

Andrews and Rabaut have chaired four in-process reviews (IPR) where they have provided guidance and encouraged participants to take risks and to "think outside the box." The most recent IPR was held in July 1996 at UDLP facilities in York, PA. Representatives from each of the seven councils and UDLP customers participated. Prior to this IPR, all IPRs had been held at TACOM in Warren, MI, allowing the contractor to have more of his program managers and Defense Contract Management Command (DCMC), and Defense Contract Audit Agency personnel to participate.

The latest in acquisition streamlining programs was easily incorporated into this major partnering effort. Single process ini-

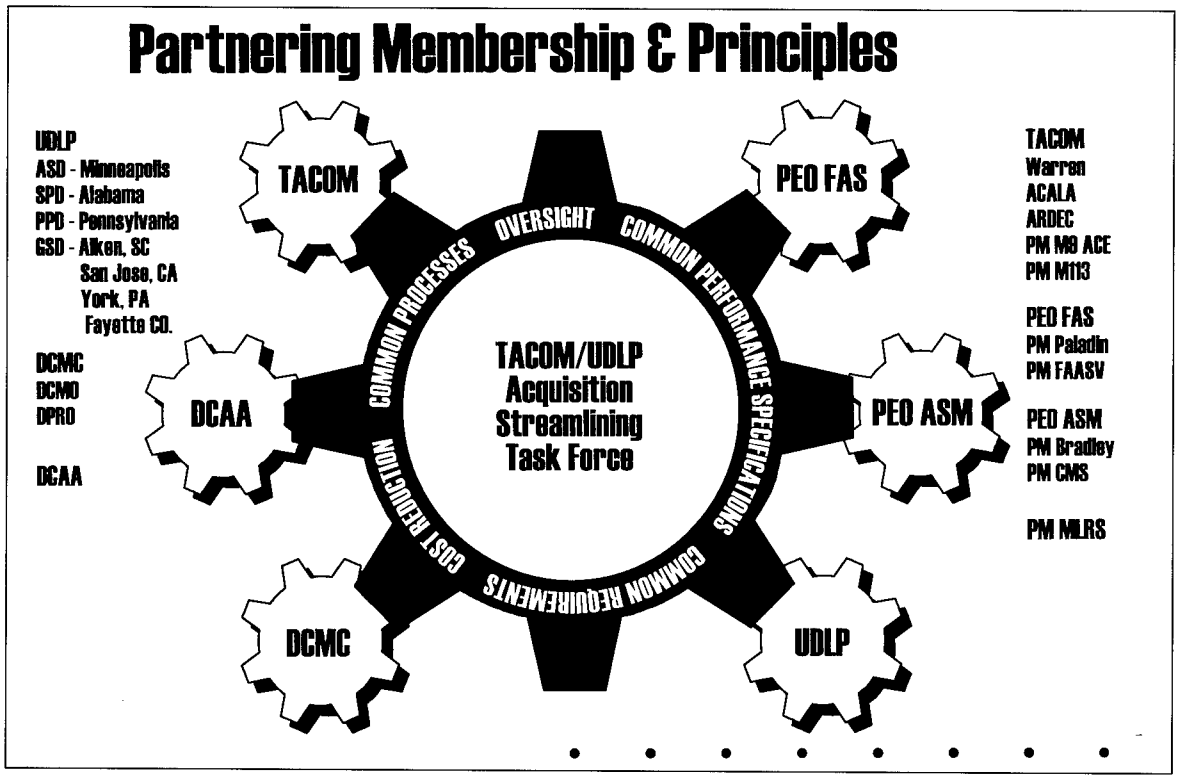

Figure 2.

tiatives/block change modifications are implemented by DCMC such that a contractor will submit a concept paper to the government and then a management council will convene to evaluate the proposal. Under the TACOM/UDLP partnering arrangement, government and contractor representatives work together as a team to develop the initiative. After the team members agree upon the change and the savings/cost avoidance, the proposal is submitted to the UDLP approval authority for finalization. The concept paper is then submitted to the government for final approval. This process reduces the time it takes to implement single process initiatives. Reduced time and costs are not the only benefits derived from this unique arrangement. Building trust in relationships that, in the past, were somewhat adversarial is a benefit not easily measured in dollars and cents. DOD sometimes implements rules and regulations to prevent negative experiences from reoccurring. In reality, the rules do not necessarily prevent negative experiences. However, improving the process and changing the culture can minimize undesirable actions by both government personnel and DOD contractors.

The partnering process includes stakeholders from all UDLP-GSD sites and their customers. In addition, UDLP-Steel Products Division, UDLP-Paladin Production Division and their customers are represented when relevant issues are being addressed. These stakeholders represent a mixture of programs in various stages of acquisition. (Bradley, MLRS, C2V, EFVS, BFIST, M9 ACE, M88, Paladin, M109, Hercules, Breacher, M113 FOV). See Figure 2.

To date, 32 initiatives have been implemented, resulting in substantial contract savings and cost avoidance. These initiatives range from standardizing common quality provisions, to lot testing on the Bradley 25mm Gun, to various supplier quality initiatives (e.g., reduce receiving and source inspection, reduce cyclical audits, reduce or eliminate control testing, and reduce or eliminate the need for weld procedure approval) to eliminating the use of certificates of conformance. These initiatives are only the tip of the iceberg. Many more initiatives will be submitted in areas to include common processes for paint, part marking and phoscoating, aluminum welding, co-mingling of parts, alpha contracting bill of material process, streamlining process for negotiating a forward pricing rate agreement, standardizing logistics contract language/requirements and many more.

The councils and teams continue to work on more initiatives, including eliminating duplicate government/contractor procurement audits and combining government spares with contractor production buys. More ideas surface each time these councils and teams meet. Indeed, the Quality Partnership Council plans to host a Supplier Symposium with the goal of drawing its suppliers into the process to generate additional ideas for acquisition streamlining.

Conclusion

The task force is all about trust and the drive to eliminate non-value added requirements and oversight. Its processes and structure will continue to evolve and streamline so that initiatives are brainstormed, developed, agreed upon and implemented much faster. Individuals generating more and more ideas and taking calculated risks are the key to ensuring that the task force continues to thrive.

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OPPORTUNITIES IN INTERNATIONAL BUSINESS AND GLOBAL RESOURCING

By John R. Gresham

Editor's note: *The words "Defense/Defence" are spelled according to their United States or French reference.*

Introduction

In late October 1996, the rural residents of Caroline County, VA, must have wondered what was happening when businesses near Fort A.P. Hill were frequented by numerous visitors sporting accents from 10 member nations of the North Atlantic Treaty Organization (NATO). Then, when national news media converged, it became apparent that something unusual was happening. But, what?

Structured Technology Demonstration

The event attracting this attention was a Structured Technology Demonstration (STD) on Battlefield Surveillance, Target Acquisition, Night Observation and Electronic Warfare. Held Oct. 22-23, 1996, and sponsored by NATO Army Armament's Group's (NAAG) Land Group 6, the STD is believed to be one of the largest such sponsored events of the decade. Moreover, it combined aspects of a military exercise and a side-by-side technology comparison of over 70 advanced day and night vision systems.

While the STD and a following NAAG Working Group meeting were sponsored under the NATO banner, the United States served as host nation. Planning and execution responsibility rested primarily with COL Jeffrey Sorenson, Project Manager, Night Vision/Reconnaissance, Surveillance and Target Acquisition (PM-NV/RSTA), and his staff. Scientific and operational facilities for the STD and additional support were provided by the U.S. Army Communications-Electronics Command's (CECOM) Night Vision Electronic Sensors Directorate (NVESD), and its Director, Dr. Louis Marquet.

Of 16 NATO member nations, 10 par-

(Left to right) Dr. William Perry, former Secretary of Defense; LTG Ronald V. Hite, Military Deputy to the Assistant Secretary of the Army (Research, Development and Acquisition (ASA(RDA)); and Gilbert F. Decker, ASA(RDA) and Army Acquisition Executive, receive an update at the NATO Structures Technology Demonstration from Dan Hosek, project leader for Sniper Night Sight, on image intensifier device technology.

Dr. William Perry (center), former Secretary of Defense, and Gilbert F. Decker (right), ASA(RDA) and Army Acquisition Executive, examine a Mini Eyesafe Laser Infrared Observation Set (MELIOS) at the NATO Structured Technology Demonstration.

ticipated in the STD. This wrapped up a nearly two-year planning process. Those nations which did not demonstrate their technology, opted out due to increasingly tough financial realities facing most international Defense establishments. Overall though, participation in this event demonstrated tangible multilateral support to NATO rationalization, standardization and interoperability goals. Of the approximately 70 sophisticated NV/RSTA systems available internationally, all were selected for demonstration based on their being the very latest in technological advancement.

Attendees

In addition to local, national and international news media, approximately 200 U.S. invitees attended. These included a cross segment from the Army science and technology, and program management communities. Other governmental entities such as the Department of State and the Defense Technology Security Administration were also well-represented.

America's commitment to the success of the STD was also demonstrated by attendance of senior officials including: Dr. William Perry, then Secretary of Defense; Gilbert Decker, Assistant Secretary of the Army (Research, Development and Acquisition) (ASA(RDA)) and Army Acquisition Executive; and LTG Ronald Hite, Military Deputy to the ASARDA. In addition, staff from NATO member embassies, Capitol Hill, and nearly 100 decision makers and technologists from the NATO community attended the STD.

The criteria regulating the inclusion of a system were determined by each respective nation's Defense Department or Ministry of Defence, with much attention to premier systems and allowing their contractors to assist on-site. What made this demonstration so unique was the unparalleled opportunity for participants to observe multinational electro-optical systems in a side-by-side comparison during day and night operational environments. The use of smoke (moving and stationary targets) at varying ranges was "revealing" depending on which systems were used. With Thermal Forward Looking InfraRed (FLIR) image intensifiers and a variety of other technologies, there was no lack of opportunity to compare diverse targets at ranges from a few hundred meters to more than four kilometers.

Each day during the STD, a three-hour demonstration was conducted during daylight hours and another after dark. International observers were able to directly compare the relative performance of each of the approximately 70 systems at different distances. Targets included moving vehicles, stationary vehicles and man targets in the open, and behind foliage or even in foxhole-like environments. Army Reserve units also complicated these target scenarios by "popping" a variety of smokes at regulated intervals. The value of presenting targets under realistic conditions demonstrated the effectiveness of FLIRs and image intensifiers under certain conditions and which systems or technologies offered technical superiority. These side-by-side comparisons would simply not have been available to prospective NATO buyers in more market-oriented venues, such as the annual Association of the U.S. Army show in Washington, DC, or similar military expositions.

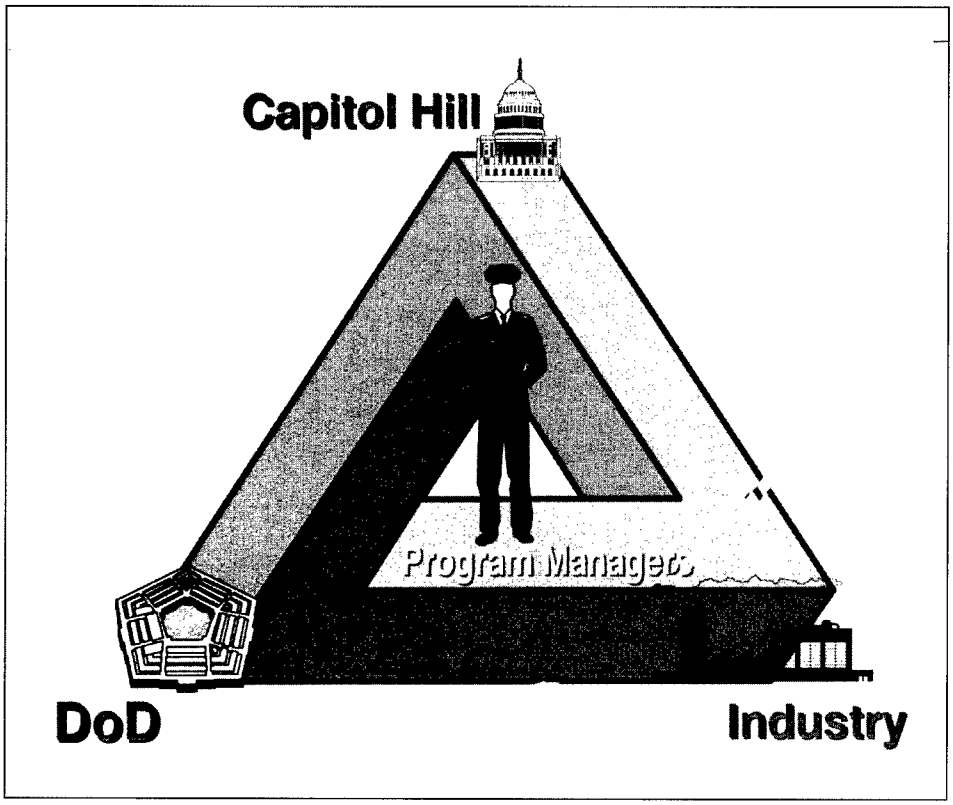

Figure 1.
The Iron Triangle of Program Management.

Why Is This Of Value To A Program Manager?

MG David R. Gust, Program Executive Officer for Intelligence, Electronic Warfare and Sensors (PEO-IEW&S), summed up the importance of such international efforts in his article, "Intelligence and Electronic Warfare Program Executive Office Participates In EUROSATORY 96," published in the November-December 1996 issue of *Army RD&A*. About his organization's recent participation at the June '96 EUROSATORY Land Defense Exposition in LeBourget, France, MG Gust said, "... participation in this major land armaments exhibition illustrates the importance we attach to helping the U.S. Army achieve maximum interoperability and commonality of equipment among its allied and coalition forces."

Even though many people think in terms of programs as being either international or purely domestic, the reality is that international implications affect most DOD programs. Let's take MG Gust's, subordinate organization PM-NV/RSTA, which we have already highlighted, as an example where international aspects affect each system's life and the workload of the staff.

Mobilization Base Sustainment

In the case of night vision image intensification goggles, for example, mobilization base considerations are paramount. For a manufacturing industry where five firms have been reduced to two, showing U.S. products to appropriate potential foreign military sales (FMS) or direct sales cus-

tomers is key. Every dollar from whatever legitimate source that reaches the manufacturing base helps keep prices down and Defense industry technology production lines operating. In an environment where mobilization base dollars are non-existent, approved direct sales or FMS to approved nations is of great importance. This financial imperative ties directly back to efforts expended in hosting or participating in international events.

A few of the key specific lessons learned from the PM-NV/RSTA's hosting of the NATO STD included:

- First-hand knowledge of capable foreign systems and technologies;
- Greater knowledge of system and technology performance under realistic field conditions;
- Knowledge of foreign technology base capabilities;
- Identification of common areas of program interest between NATO partners; and
- Improved understanding of the "Global Resources" available to the "Own the Night" mission area.

Clearly, this newfound knowledge can be used to maintain our own mobilization base, as well as to draw foreign partners and global mobilization resources into the program management equation.

Even so, no organization can expect to enter into complex international business relationships without first building the necessary personal and organizational relationships. That is where having a vision allows empowered professionals to tackle major events such as hosting an STD for allies or in participating in a major international Defense exhibition such as EUROSATORY.

Americans and Europeans, whether they are from industry or government, prefer dealing with those they know and trust. However, it does require consistent involvement over time to create and maintain workable governmental/industrial complex working-level relationships. Therefore, attendance at trade shows, technical conferences, and NATO activities over time is key to developing and maintaining a position as a known and respected international player.

Export Policy, A Two-Edged Sword

Like it or not, PMs must also deal with a world ruled by the complicated International Traffic in Arms Regulations. For most commodities, which are dual-use or strictly military in nature, there is a well-defined process used by the Department of State and Defense Technology Security Administration to grant or deny export licenses for specific devices and manufacturing technology.

When predominately military items are sought abroad, a PM must be ever mindful of questions such as: May the particular commodity be sold? or Would such a sale jeopardize the position of American soldiers on some future battlefield? Tough questions? Of course!

However, only by participating in an international context can PMs and technology base personnel provide accurate, informed and reasoned inputs to policy makers on the ongoing and constantly evolving debate over what can or can not be sold abroad. Additionally, if a PM's products are defined as dual-use for civilian and military purposes, issues of exportability and even commodity jurisdiction between the Department of Commerce and Department of State become even more complicated.

An Iron Triangle Or A Maze?

When a program office embarks in the larger context of international business and global resourcing for its weapon system(s), they may be new participants in the process. There are also new rules to be learned since the U.S. program management model is not necessarily the same as used in other countries. During the 1980s, the PM mission was frequently described as an "Iron Triangle" with Capitol Hill, DOD and industry at the "points" and the PM squarely in the middle, as shown in Figure 1. Today's paradigm is far more complicated by comparison. In today's world, multiple external factors that complicate a PM's mission makes international business and global resourcing issues seem more like the illustrated maze shown in Figure 2.

Foreign Comparative Test—Another Way To Leverage Opportunity

Even in times of downsizing there are resources available for those with vision and creativity. Suppose a PM needs money to evaluate an existing foreign item to satisfy mission requirements or to help establish, maintain or expand a mobilization base capability (which in today's environment may include industry from our foreign partners). Congress has a program designed as a PM's ally in such cases. The funding provided annually by DOD via the Foreign Comparative Testing (FCT) Program can be a boon to those considering or seeking to acquire quality foreign products. The FCT Program furnishes Office of the Secretary of Defense (OSD) funding for test and evaluation of foreign products, and also provides a bridge-building alliance between the U.S. government, our industrial base and our foreign partners.

According to COL Randall Catts, OSD's Manager for the FCT Program, "Congress authorizes approximately 33-35 million dollars each year. These funds are allocated to individual Service sponsored projects, each of which is selected on its own merits. In FY-97, the Army garnered about a third of the FCT projects in terms of dollars allocated and also in the number of FCT projects managed."

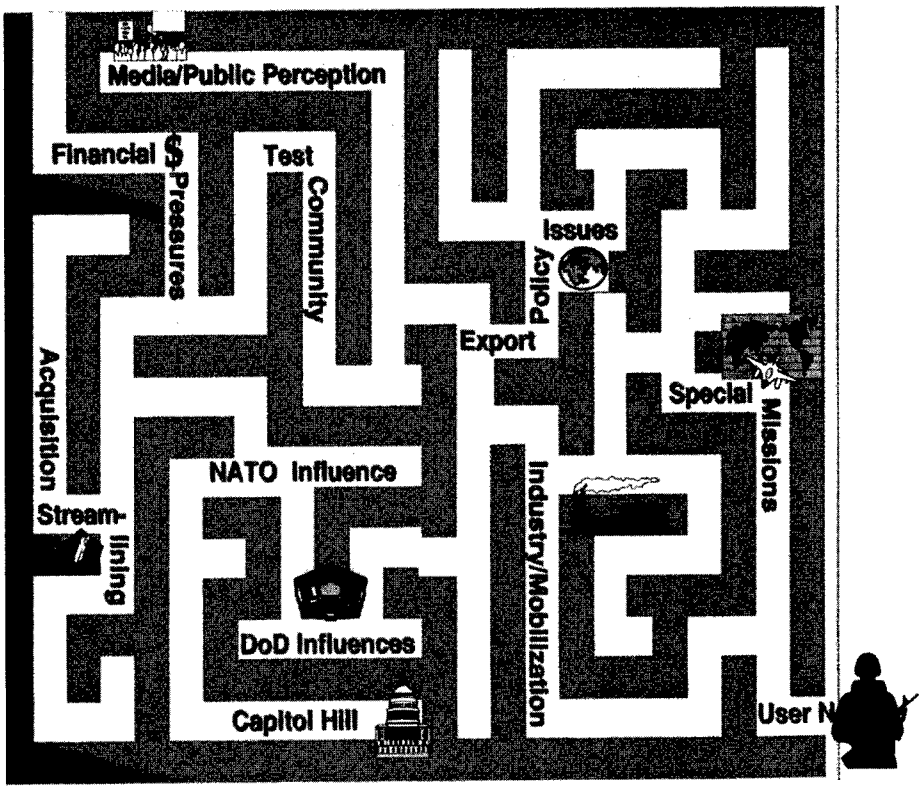

Figure 2.
DOD's Program Management Maze.

DSMC Course Offerings

The topics raised in this article are just the tip of the proverbial international iceberg. For those whose curiosity has been whetted, the Defense Acquisition University's (DAU) Defense Systems Management College (DSMC) offers several superb courses that stress "international." Some of these are:

- **The Multinational Program Management Course (DAU Course, PMT 202).** This offering stresses social, political, cultural and economic factors affecting an international effort. It also covers international financial, contracting and management arrangements, along with information and technology security. Other topics review the roles of other governmental agencies in international programs, U.S. industry roles and memoranda of understanding and/or agreement.
- **The International Security & Technology Transfer Control Course (DAU Course PMT 203).** This class covers technology security considerations with international data exchange agreements, such as the National Disclosure Policy on Technology Transfer. It even includes instruction on acquisition documentation requirements for international programs. Topics of import/export licensing, contractor operations and even partnership approaches to foreign military sales and cooperative development of armament systems finish the list.
- **Advanced International Management Workshop (DAU Course PMT 304).** This course is the capstone of international course offerings at DSMC. This offering is a detailed "nitty gritty" offering that covers a number of key day-to-day issues faced in an international program environment.

"Congress's intent for a successful FCT candidate project requires only an honest intent to procure the foreign product for DOD use when the product meets service requirements and represents best value," said COL Catts.

One can not just take the money and run. Working with foreign firms poses unique, but not necessarily difficult, challenges ranging from managing timely obligations, meeting Congressional intent, and helping foreign offerors with special problems such as data releases and U.S.-specific contracting regulations. One must be aware that when FCT dollars cross the ocean, expectations for long-term relationships are created in the foreign contractor's facility, as well as in that nation's Ministry of Defence. Simply put, an FCT dispute could quickly become a diplomatic issue if proprietary information isn't safeguarded or the playing field isn't level. Even so, the FCT Program is effective and highly respected by many partner nations. In addition to the European community, Canada, Australia and Israel are cited as frequent "FCT participants."

Caveats aside, let's take the PM-NV/RSTA Second Generation FLIR (SGF) Program for Ground and Air Platforms as an example of an FCT program in action. The Army program concept for SGF is to develop a common FLIR that can be mounted on any number of combat platforms saving costs and providing all users with the ability to see the same battlespace. In planning for deliberate risk reduction, Army leaders decided to develop second sources for critical components (hence expanding our mobilization base). By combining this goal with OSD-provided FTC dollars, the United States has been able to award "external" POM dollars to a number of European contractors to meet our objectives of risk reduction and development of potential second sources. At present, Standard Advanced Dewar (thermal detectors) Assemblies and linear drive coolers contracts which support the SGF Program have been awarded in France, Germany and the Netherlands. Other FCT efforts are pending.

By taking advantage of trade shows, FCT funding and participation in NATO activities, the NATO member nations are giving the PM-NV/RSTA FLIR a much closer look as having the potential to meet their battlespace "Own the Night" needs for combat platforms. Further, they are now being encouraged by their own Defense suppliers who stand to gain as partners in the system development process. This process certainly makes multilateral international involvement well worthwhile.

Summary

In summary, it is clear that modern program management is a complex business, even if it is not just an environment where the PM relates solely to DOD, industry, and Congress. It is a maze, but mazes can be fun and challenging to those who dare to explore the range of possibilities. For those who like to think outside the box, program management is where the action is.

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TARDEC VISUAL PERCEPTION LABORATORY

By Dr. Grant R. Gerhart
and Dr. Thomas J. Meitzler

Cooperative R&D Agreement

The U.S. Army Tank-Automotive Research, Development and Engineering Center's (TARDEC) National Automotive Center (NAC) is developing a dual-need Visual Perception Laboratory as part of a blanket cooperative research and development agreement (CRDA) between General Motors Corporation (GM) and the U.S. Army Materiel Command (AMC). TARDEC and GM researchers are using this facility to calibrate and validate human performance models for the evaluation of collision avoidance countermeasures for commercial and military vehicles on the nation's highways.

According to 1990 National Highway Traffic Safety Association statistics, the annual cost from automotive collision accidents is approximately $135 billion, exclusive of pain and suffering. Approximately 30 percent of these accidents are related to some type of human vision deficiency and 14 percent occur at intersections. Military personnel in various types of convoy accidents have suffered nearly 500 injuries with considerable loss of life and millions of dollars in vehicle damages during the last five years.

The GM CRDA consisted of two distinct phases. The first was a proof of principle demonstration that the TARDEC Visual Model (TVM) could predict the relative conspicuity or detectability of automobiles with different types of brake light configurations. Comparisons were made between TVM predictions and empirical results for a New York taxicab study which showed that automobiles with the third tail light, or Center High-Mounted Stop Light, had a range of 5-20 percent fewer rear-end collisions than the control group with standard brake light configurations. The modeled and empirical results correlated quite well leading to the second phase of this two-year effort.

Phase II Visual Perception Experiment

The Phase II portion of the CRDA used the NAC Visual Perception Laboratory (NAC-VPL) to calibrate and validate the TARDEC visual models for several intersection scenarios in northern Michigan. Extensive field tests were conducted over a two-month period during the summer of 1995. Super VHS video recordings of moving automobiles approaching rural intersections were edited onto three computer-controlled laser disks and presented to 30 observers. The search strategy was determined by a series of GM field tests using instrumented observers to monitor the sequence and length of time each person looked through the passenger, front, and driver windows toward the oncoming and receding traffic. Figure 1 shows a schematic of the fully automated data acquisition and analysis hardware used in the laboratory. A unique capability of the laboratory is the magnetic head tracker mounted on the observer which automatically controls the correct image display at an appropriate time during the intersection search scenario. An additional capability in

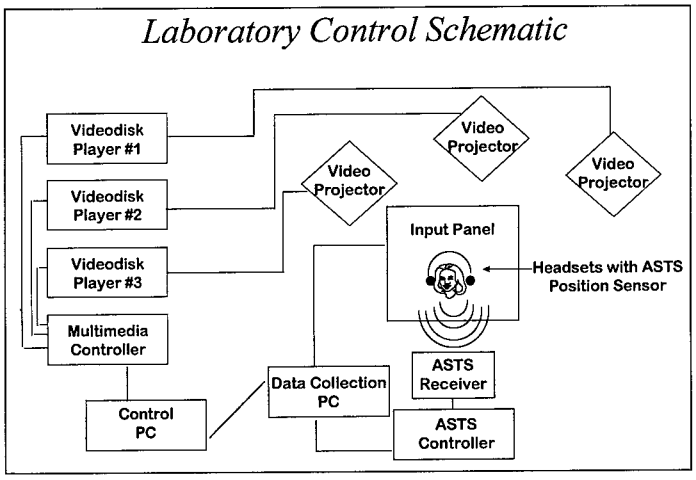

Figure 1.

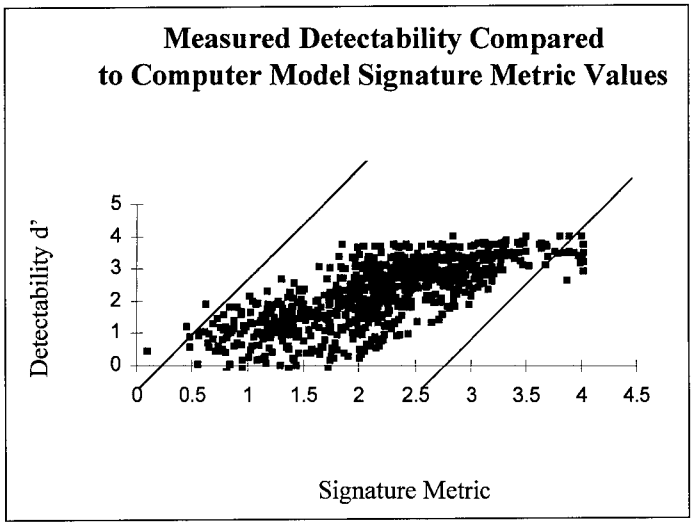

Figure 2.

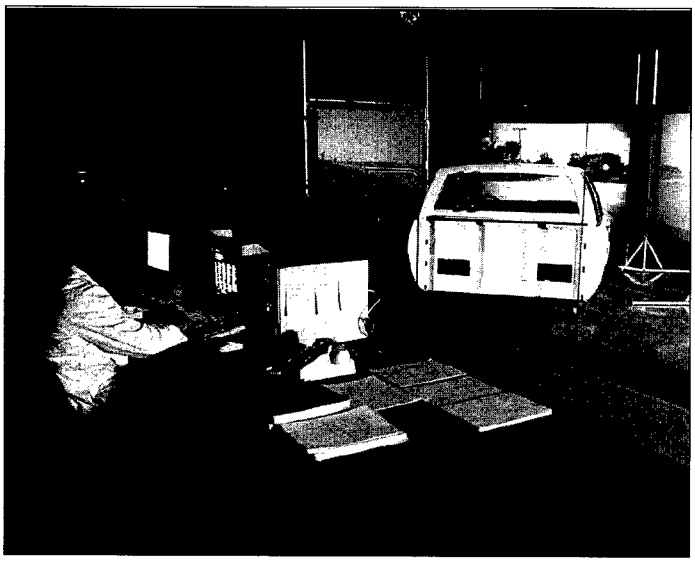

Figure 3.
A view of the main test area as seen through the control room window.

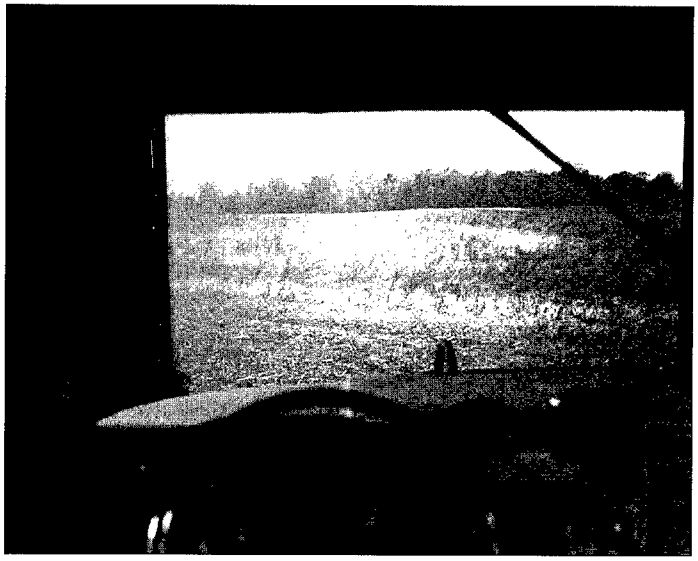

Figure 4.
A visual scene containing camouflaged targets located along a tree line depicted from behind the driver's head position through the front windshield of a high mobility multipurpose wheeled vehicle.

the near future will include a head tracker to record instantaneous eye position relative to the scene.

Figure 2 contains a plot of automobile detectability or d' as a function of log signature metric for several hundred images where each data point represents an average over 30 observers. These results were generated by the NAC Visual Perception Model which used the same input image data that was presented to the laboratory observers. The variance in the observer response originates primarily from differences in the visual stimuli due to ambient light level, atmospheric visibility, background clutter and automobile signatures.

The correlation between model and laboratory data was nearly 80 percent and is much higher than typical correlation between model and field test data. The laboratory experiments have several advantages over field test exercises including better control over observer stimuli, larger sample sizes and lower cost. In particular, laboratory perception tests offer a viable and economic way of augmenting field test data by using image simulation techniques to extend the range of conditions and target/background signatures beyond the original field test conditions. These techniques are particularly useful for virtual prototyping applications.

Perception Laboratory Facilities

Figure 3 shows a view of the main test area as viewed through the control room window. The entire facility consists of a 2,500-square-foot area which can accommodate vehicles ranging in size up to the Bradley Infantry Fighting Vehicle. This scene also shows the GM half-car mock-up used in the CRDA perception experiments surrounded by the three video projection screens which display the driver's front, left and right views of the intersection traffic. Figure 4 shows a visual scene containing camouflaged targets located along a tree line depicted from behind the driver's head position through the front windshield of an HMMWV. Visual perception experiments conducted from such scenes will allow Army researchers to study wide field of regard (FOR) search and target acquisition (STA) strategies for low-contrast military vehicle signatures.

Army Acquisition Process Impact

Figure 5 depicts the economics of early test and evaluation showing where the NAC-VPL provides complementary design, test and evaluation methods which augment available resources in computer simulation and field testing. Often the vehicle virtual prototyping process for STA and signature modification technologies relies exclusively upon computer modeling and simulation during the early concept exploration phase. These results are usually empirical in nature, inaccurate for complex scenarios, require extensive calibration and validation for specific visual tasks, and are difficult to correlate with field test data. The Army's STA models fall into this category in spite of dramatic improvements in recent years with the advent of computational vision models.

The NAC-VPL uses virtual surrogate vehicles as stimuli for human observers by combining existing target/background data sets and synthetic image renderings from computer-aided engineering models. The NAC-VPL test results provide additional credibility for model predictions and lead to more robust requirements and specifications definitions of the original user requirements. The immediate gain is a reduction in the number of design options early during the product development cycle which can accelerate the acquisition process from the advanced technology demonstration stage into engineering materiel development (EMD).

Laboratory perception testing also plays an important role in EMD and subsequent production and development programs by reducing the test cost per option and the cost of individual design changes. Many vehicle signature field tests cost upwards of $1 million or more, and often result in limited amounts of data, poor reproducibility and unrealistic observer tasks. A hybrid technique will augment the available field test data while allowing much of the actual perception testing to be accomplished under controlled laboratory conditions.

Figure 6 relates the role of the NAC-VPL to the operational test and evaluation and developmental test and evaluation components in the Army materiel acquisition process. Laboratory perception testing makes an important contribution to each stage and its associated milestones during the entire product development cycle. Especially important elements are the continuous design feedback before and after the contractor down selection along with empirical Pd data for COEA and other battlefield effectiveness model simulations.

Future Activities

The next phase of the NAC-VPL will upgrade the observer display to a continuous wrap-around screen with high-definition television image quality. This step is necessary in order to meet the requirements of the next generation wide FOR STA models. An important element in this process will be the further development of advanced human visual performance models which consist of two primary modules. The first is an early vision module which is inherently phenomenological in character and contains the primary elements of the signal processing between the retina of the eye and visual cortex. The second is the statistical decision or human performance module which is inherently predictive or empirical in nature and must be calibrated and validated for each set of visual tasks. Factors such as learning effects and cognition will most likely be included using an empirical top down modeling approach and will require an extensive amount of laboratory perception testing and data analysis.

The NAC-VPL will shortly be able to operate in both a classified and unclassified mode. Future laboratory programs will involve a joint collaboration among government, academia and industry vision research scientists and engineers. The goal is to make this facility a national center of excellence available to a variety of dual-need users during the next few years.

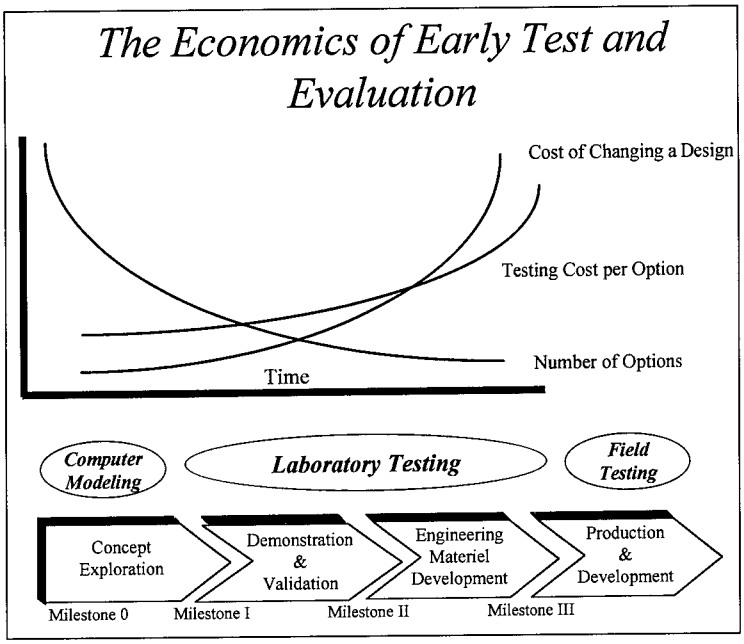

Figure 5.

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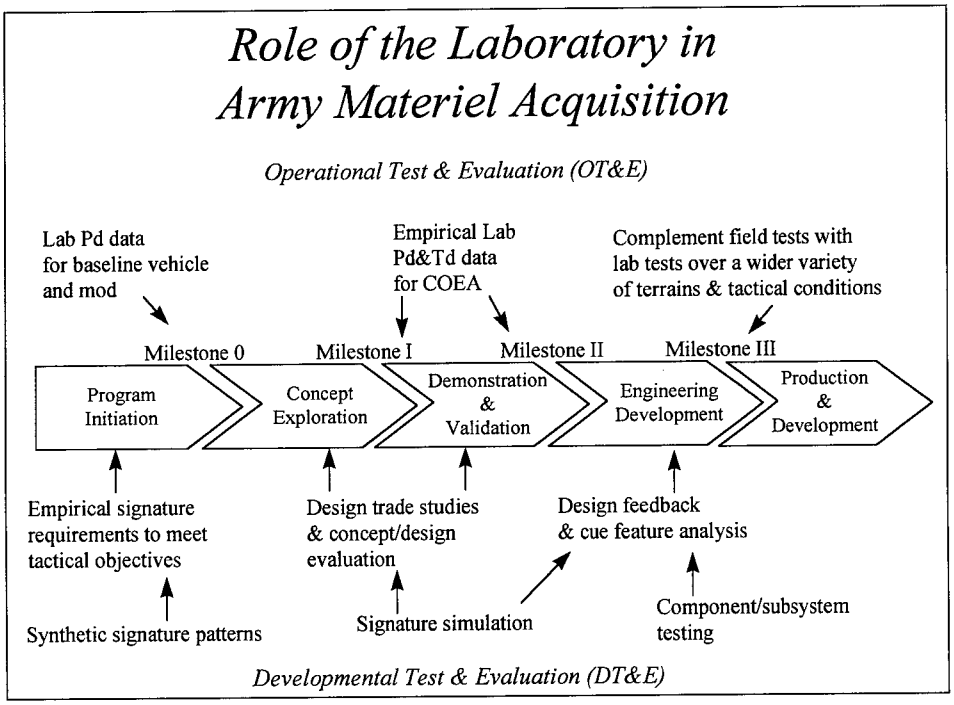


Figure 6.

LONGBOW APACHE

Training and Learning Lessons

By Ellen H. Snook

Introduction

The AH-64D Longbow Apache, armed with precision weapons and loaded with information-age technology, leads Army aviation into the digital battlefield. This capability was proven during the Initial Operational Test and Evaluation (IOTE) of the weapon system conducted by the U.S. Army Test and Experimentation Command. Aside from validating operational system performance, the test provided valuable insights on the training and learning process for employment of the digitized attack helicopter. This article highlights the training and learning the operational users have experienced in their progression through aircraft qualification training, the Force Development Test and Experimentation (FDTE), and the IOTE. Although these lessons were learned from a specific series of events, they warrant consideration in the future development of training for digital weapon system employment.

AH-64D Longbow Apache

The Longbow Apache is a product of digital technology integrated into the AH-64A Apache airframe. The most visible advancements to the attack helicopter are the mast mounted fire control radar (FCR) and radar frequency interferometer (RFI). Together, the FCR and the RFI provide a rapid and clear picture of the battlefield to the helicopter crew. Additionally, the radar sight system provides a true fire-and-forget missile employment capability through digital download of FCR data to the radar frequency Hellfire missile. FCR data also can be communicated outside of the aircraft through an improved data modem. Control and management of these new and existing capabilities are facilitated by two multifunction displays in each crew compartment.

The Longbow Apache is designed to be employable in two, changeable configurations. One configuration includes the FCR and RFI, the second configuration does not. Typically, a Longbow team consists of one lead aircraft with the FCR and RFI and one or two wing aircraft without. When tactically employed, the lead aircraft unmasks only the FCR to scan the battlefield while the wing aircraft remains in defilade. Immediately after scanning, the lead digitally transmits targets to the wing. Instantaneously, the attack team has coinciding situational awareness. In this same manner, an entire company of Longbow Apaches can have near simultaneous battlefield awareness.

Tactics, Techniques, And Procedures

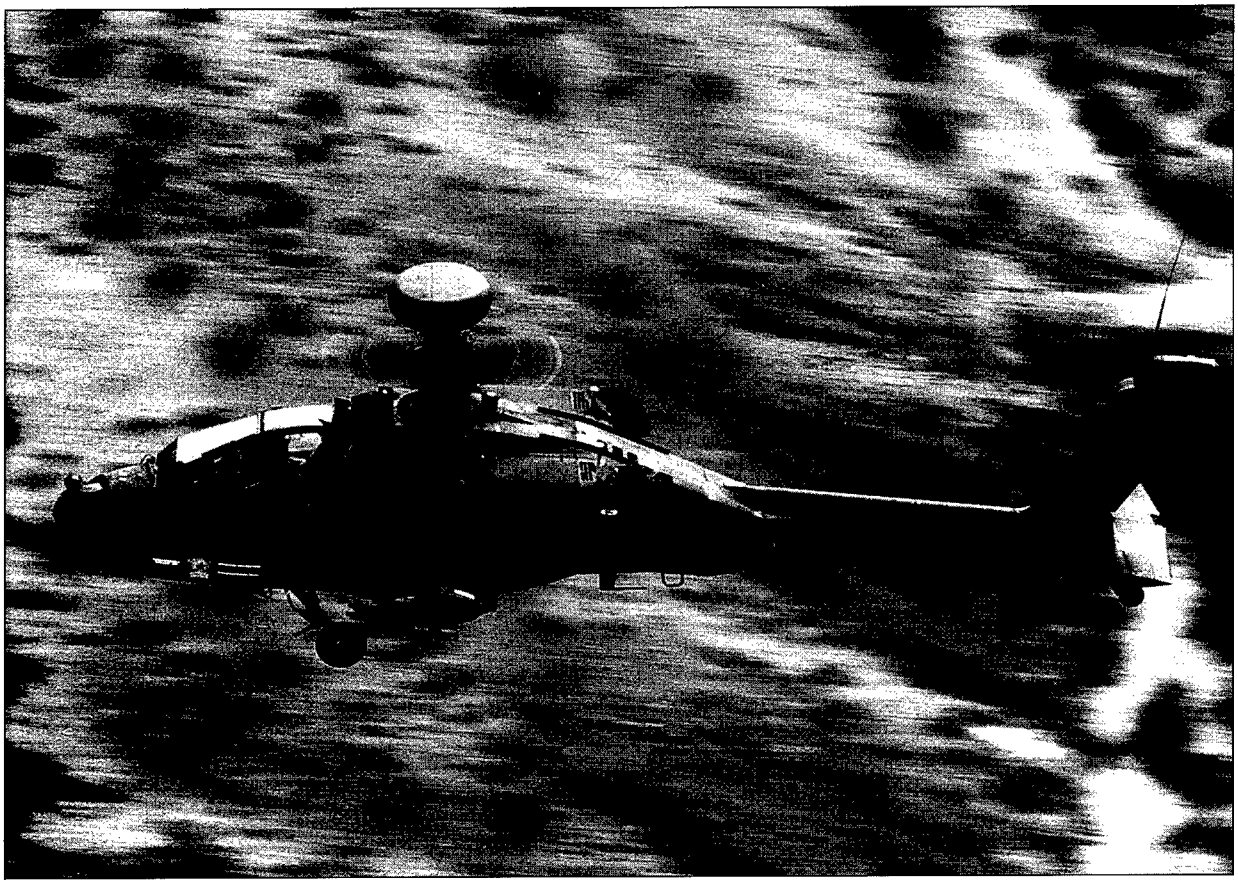
The basic attack helicopter tactics, techniques, and procedures (TTP) were used as the basis in an evolutionary process of testing and developing new Longbow TTP. The combat developer initially experimented with conceptual employment methods during the Early User Test and Evaluation in 1990. The success of this test was followed by crew station developmental efforts using the McDonnell Douglas Helicopter Systems' Engineering Development Simulator (EDS). The EDS consisted of two high-fidelity crew station modules and four low-fidelity computer work stations. The work stations could be operated as lead, wing, or threat aircraft. Throughout engineering development, TTP continued to evolve.

In 1992, the combat developer tested and validated Longbow TTP concepts using the EDS in the force development data collection effort. The product of these progressive efforts was the training test support package which contained the Longbow TTP. The training program for the Longbow Apache Aircraft Qualification Course (AQC) also was progressively developed under guidance of the combat developer and the training test support package. McDonnell Douglas Training Systems was contracted to design and execute the AQC for the FDTE and IOTE unit and for initial fielding. In July 1994, one attack company of pilots attended the AQC where critical individual tasks were trained through classroom academics, simulator flight, and aircraft flight. After the AQC, the combat developer presented Longbow TTP to the test unit through guided discussion and hands-on training in the EDS.

Force Development Test And Experimentation

The Longbow company of pilots went directly into the FDTE following AQC. The primary objectives of this test were to evaluate the operational effectiveness of the Longbow TTP and the training effectiveness of the AQC and the EDS. These evaluations were accomplished by assessing the Longbow company's mission performance. Four tactical vignettes were developed to encompass realistic attack helicopter missions: movement to contact, deep; deliberate attack, deep; deliberate attack, close; and hasty attack, close. Phase one was conducted in the EDS, in part, to allow the crews to perform collective training. Phase two was conducted in force-on-force battle at Fort Hunter Liggett, CA. The same vignettes were executed in both phases.

A Tactical Steering Committee assessed TTP and training effectiveness. This committee included subject matter experts from the Army Aviation Center, Combat Aviation Training Brigade, National Training Center, and McDonnell Douglas Helicopter Systems. After each mission, the committee debriefed the Longbow crews on tactical employment and training issues. They also guided the crews in experimenting with TTP to improve mission effectiveness. In total, 32 simulated missions (16 day, 16 night) and 12 force-on-force missions (eight day, four night) were executed.



The AH-64D Longbow Apache.

Initial Operational Test And Evaluation

One major objective of the IOTE was a side-by-side effectiveness evaluation of the Longbow Apache vs. the baseline Apache. A second attack helicopter company from the operational test unit made up the baseline Apache company. The first phase of the IOTE was gunnery conducted at China Lake, CA. Tactical events included helicopters scripted to demonstrate comparative targeting and engagement capabilities. Varied target conditions (moving or stationary, smoke obscured or not, netted or not) and ranges (short or long) were presented to challenge the aircraft sight and weapon systems.

The force-on-force phase of IOTE followed gunnery, and was conducted at Fort Hunter Liggett, CA. The four vignettes used in the FDTE were used in this phase but were conducted at different terrain locations. Each company had six aircraft available for each mission. Four of the Longbow Apaches were with FCR, two were without. Each company was given the same operations orders, but each planned and performed missions independently. Fifteen missions (12 night, three day) were executed by each company. Though there was not a Tactical Steering Committee during the IOTE, the Longbow crews continued to learn and experiment with employment methods in accordance with the TTP. Their learning experiences were captured in debriefs and interviews throughout the IOTE. At the conclusion of the IOTE, the Longbow crews recounted many lessons learned.

Lessons Learned

• ***Simulator Training.*** Longbow crew members agreed that the EDS crew station trainer was an excellent tool for training individual and crew tasks. However, because the EDS was developed for use as an engineering design tool, inherent limitations compromised tactical training. A notable deficiency was the inadequate replication of FCR functionality. Specifically, the radar map mode of the FCR was not implemented, so crews did not receive practical hands-on training in this mode. When given the opportunity to experiment with the FCR, crews devised innovative applications for the radar map mode that significantly increased their survivability.

The EDS computer work stations had a noticeable impact on collective training. Functional limitations of the work station interface and the simulated improved data modem precluded full and faithful execution of TTP. As a result, crews could not effectively achieve collective and combat skills through EDS training. These deficiencies were evident in the Longbow company's mission performance during the transition from the EDS to the force-on-force phase of the FDTE.

While the EDS configuration was not optimized for collective training, crews stated that it was useful for exercising the mission thought process and other cognitive processes such as information management. As training in simulation becomes increasingly relied upon, it will be even more critical to recognize the functional and tactical limitations of simulator devices to ensure that training intent can be achieved.

• ***Live Training.*** Without realistic experiences in the actual aircraft, crews struggled with executing new Longbow TTP. The force-on-force phase of the FDTE presented their first live missions. At this phase, the crews were striving to validate learned ca-

pabilities of the actual aircraft systems while applying new TTP against an extremely challenging threat force. These circumstances hampered their transition from A-model tactics to Longbow tactics. After completing the IOTE, crew members assessed their employment methods during the FDTE as "fragmented" because they held on to A-model tactics as they tested Longbow capabilities and tactics.

During the IOTE gunnery phase, crews achieved a significant level of learning as they employed the weapon system and witnessed it perform "as advertised," over and over again. Reduced time and threat pressures of gunnery, combined with an increased understanding of system capabilities, promoted their development of combat skills. By the end of the gunnery phase, successive training and learning allowed crew members to develop an appreciable level of confidence and comfort in employing Longbow.

Following the gunnery phase with the force-on-force phase provided the opportune environment for crews to capitalize on strengthened confidence and skills. Through progressive experimentation in simulated and live training, the Longbow company continuously improved tactical proficiency. Increased capabilities were evident in significantly improved mission performance between the FDTE and IOTE and in superior performance vs. the baseline Apache company. Learning was evident in crew members' abilities to realize and describe, in great detail, effective and ineffective methods used. This level of learning and confidence could not have been realized without live training.

• ***Training and Learning.*** This operational test process offered ideal training to the Longbow Apache company. Through progressive academics, simulator training, and tactical missions, a high level of combat proficiency was attained. This extent of training would be cost prohibitive on a unit training budget. However, lessons learned can be applied to focus and develop future training. One fundamental requirement identified was the need for formal training beyond the crew level. This is because of the expanded responsibilities of digitization. Given realistic training opportunities and license to experiment, the Longbow crews developed and learned effective methods to coordinate new capabilities and duties. These learned skills should be further developed into future combat skills.

Another significant training lesson learned was the effect of confidence on the learning process. Confidence in system capabilities allowed crews to concentrate on building and realizing their own capabilities. This, in turn, progressed their learning process. Academic instruction imparted the knowledge, but live tactical training advanced the correlation of knowledge, experience, and skill. By the end of the IOTE, crew members were employing and proposing innovative attack helicopter tactics using the Longbow Apache capabilities. Details of the operational test pilots' experiences can be found in the article, "AH-64D Longbow Apache: A User's Perspective," which was published on pages 40-45 of the Oct. 31, 1995, issue of *Army Aviation*. Details of the AH-64D Longbow Apache FDTE and IOTE can be found in the test and evaluation reports.

• ***Digitization and Information Management.*** Digitization was the predominant factor in the superior performance of the Longbow company over the baseline company. The increased quantity and quality of information provided by digital sensors, displays, and communications offered unprecedented situational awareness. The Longbow company used the information effectively, but realized a need for management skills and training. Digitization forced the crews to make additional decisions at the tactical level to process and distribute information within rigid battlefield time constraints. Digitization also expanded the soldiers' scope of battle with the capability to directly coordinate across elements of the battlefield.

In the digitized battlefield, well-defined management skills will be critical for effective administration of expansive responsibilities. Management skills will help the soldier to automate mundane information processing so that attention can be focused on making decisions pertinent to rapidly changing battlefield conditions. Without basic information management skills, workload demands can rapidly increase to negate the significance of digitization. The insights gained from this operational test should be considered in defining measures of effectiveness for future tests to continue the development of information management as a critical combat skill.

During the Initial Operational Test and Evaluation gunnery phase, crews achieved a significant level of learning as they employed the weapon system and witnessed it perform "as advertised," over and over again.

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ON THE JOB TRAINING FOR CONTINGENCY CONTRACTING OFFICERS

By MAJ Nicholas L. Castrinos

What If...?

What if ... you were a brand new acquisition officer with no experience, assigned to a U.S. Army Forces Command division as something called a "Contingency Contracting Officer" (CCO)? How would you, or more accurately, how could you, deploy with your unit and accomplish your assigned mission? Put aside for the moment the lack of Army-wide or Service-wide doctrine. For some new acquisition officers assigned to corps and divisions, these questions should be important. This article will explain how some CCOs at Fort Hood, TX, have dealt with these issues.

Background

For the past three plus years, the Acquisition Corps has been assigning contracting officers at the corps and division level. The job title is "contingency contracting officer." The CCO mission is to deploy with the torch party or the advance party during no-notice deployments, NTC rotations and all contingency missions. CCOs provide all locally available "off-the-shelf" items, leases and services to deployed units in a forward deployed area. During these operations, deployed soldiers need large amounts of supplies, civilian contract services (mainly transportation and heavy lift assets) and supplies that are not readily available in our supply system. Providing such supplies and services is the mission of CCOs.

As our Army has drawn down over the last several years, one thing has been made clear to the support elements of our force—that they must do more with less. For fiscal year 1995, our Army deployed to Kuwait twice, Saudi Arabia, Rwanda, Haiti, and Somalia, on contingency-like missions with little or no notice. In fiscal year 1996, we undertook the largest contingency mission since Desert Storm—Bosnia. How will forward deployed commanders acquire all those items and services that they cannot get through the Army supply system? As in these past contingency missions, the CCO will play a major role in logistically supplying these forward deployed units.

School Training

A main objective of the Fort Hood Directorate of Contracting (DOC) is to have new CCOs attend formal Defense Acquisition University (DAU) training before they sign in to Fort Hood. As a minimum they should attend the following courses: CON 101, Contracting Fundamentals; CON 201, Government Contract Law; and CON 104, Contract Cost and Price. There is also a new course called CON 234, Contingency Contracting.

Contingency Contracting Officers provide all locally available "off-the-shelf" items, leases and services to deployed units in a forward deployed area.

Nothing can replicate the sights, sounds and smells of doing business in a foreign climate. . . like the foreign country itself. The problem is how to provide the new Contingency Contracting Officer overseas experience in a training setting.

This course was developed by the Army, Air Force and Navy in late 1996 under the direction of DAU. Classes began in August 1996. The course is also included in the list of minimum training needed by the new CCOs.

Armed with these basic courses, the new CCO is ready to start training within the Installation Contracting Office. At Fort Hood, the new CCO starts out working in the Small Purchase Contract Administration Office to get a feel of how the overall system works. This takes about two to three weeks. From there, the CCO moves on to the Purchasing Division to work under one of the simplified acquisition threshold contracting officers, learning how to write legally sufficient small purchase contracts. After working in this environment for about four to six months, the new CCO is ready for more advanced training in the Contracts Division and Contract Administration Division.

Overseas Experience

There is no substitute for experience. No matter how well the new CCO is trained in the garrison contracting environment, contracting overseas is a completely different challenge from contracting in the continental United States. Nothing can replicate the sights, sounds and smells of doing business in a foreign climate ... like the foreign country itself. The problem is how to provide the new CCO overseas experience in a training setting.

There is a location that could be available to new CCOs to gain the international experience they need to be effective during contingency missions—Kuwait. The U.S. Third Army, headquartered at Fort McPherson, GA, has a mission to maintain stored equipment on an installation called Camp Doha, Kuwait. As a part of the overall contingent of assigned personnel, the camp has a fully staffed Contracting Office. This office handles all contracting needs for the camp and acts as the main contracting office during contingencies (such as Operations Vigilant Warrior and Vigilant Sentinel). The Contracting Office has a lieutenant colonel assigned as the director of contracting, along with one major, one captain and several noncommissioned officers and civilians who run the office. During contingency missions in the Middle East, Third Army normally requests additional contracting officers to augment this office.

For The Price Of A Plane Ticket

A unit could coordinate with Third Army and the DOC at Camp Doha, Kuwait to temporarily assign the CCO to the DOC for 90 days or less training. The DOC would receive a capable contracting officer. The sending unit would get back an experienced contingency contracting officer. Most of all, the CCO would receive the best training available anywhere in our Army today. The same holds true for the DOCs in Saudi Arabia, Korea, Turkey and other offices worldwide.

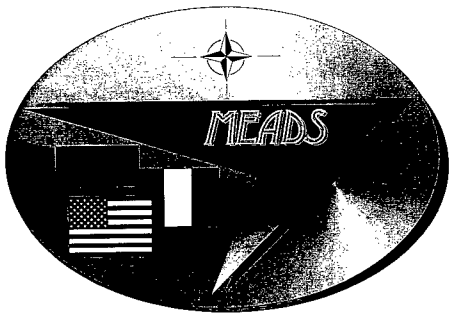
Because Camp Doha has all equipment the CCO needs, such as billeting, a dining facility, cellular phones, assigned vehicles, and office and automated data processing equipment support, the overall costs are very low. Including airfare and temporary duty, the total cost would be well under $3,000.00. The new CCO would move into a training situation tailored to teach him all he needs to know about contracting in the Middle East.

The Contracting Office at Camp Doha does all levels of contracting. The primary focus of the CCO is small purchases of supplies and services, with a fair amount of large contracts for transportation, construction and maintenance. They use computer-generated forms with a manual filing system. This system closely matches the way CCOs operate in the contingency environment. Working in this real world environment, the CCO quickly gains the knowledge needed to effectively support his unit on actual contingency missions.

Points Of Contact

To reach the Camp Doha, Kuwait operator, call DSN 318-791-8822. Ask for the Army Contracting Office. Kuwait's time zone is eight hours ahead of eastern standard time.

MAJ NICHOLAS CASTRINOS was a contingency contracting officer at the 4th Infantry Division, Fort Hood, TX, when he wrote this article. He is currently an instructor for the CON 234 course at Fort Lee, VA. He holds a B.A. degree in business from Evergreen State College, WA, and a master's degree in international relations from Troy State University, AL.



THE MEDIUM EXTENDED AIR DEFENSE SYSTEM PROGRAM

A Model For Trans-Atlantic Cooperation

By Byron D. Lawing

Introduction

The incentive for trans-Atlantic cooperation among allied nations can be traced to political, military and economic goals. In situations where common threats are being addressed and common requirements are being satisfied, cooperative programs help reinforce the military and industrial relationships that bind nations together in establishing strong, international security ties. Today, there is an increased likelihood of nations operating in a coalition environment where forces need to be deployed with equipment that is interoperable and rationalized from the standpoint of logistical support. Furthermore, shrinking budgets on both sides of the Atlantic have driven the need to combine resources and requirements in order to achieve some economies of scale in development and production. One way to achieve these goals is through international cooperative development and production.

The MEADS Program

The Secretary of Defense, on behalf of the U.S. Department of Defense; the Federal Minister of Defense of the Federal Republic of Germany; and the Minister of Defense of the Republic of Italy decided to carry out the Medium Extended Air Defense System (MEADS) Program, in cooperation. The first phase of the MEADS Program is project definition/validation (PD/V). The cooperative effort was culminated in May 1996 with the signing of the MEADS PD/V memorandum of understanding (MOU) by national armaments representatives on behalf of the aforementioned participants. The decision to carry out MEADS in international cooperation was based on the goals mentioned in the introduction, and more specifically, on the common desire of the nations to:

- Improve their mutual conventional defense capabilities through the application of emerging technologies;
- Obtain the benefits that can be achieved from standardization, rationalization, and the interoperability of military equipment;
- Satisfy a mutual need for a MEADS with an Anti-Tactical Ballistic Missile (ATBM) capability based on commonly agreed military requirements; and
- Realize the benefits that could be achieved through cooperation in this program.

On Dec. 16, 1996, the National Armaments Directors (NADs) conducted a MEADS Program Initiation Ceremony at the NATO Medium Extended Air Defense System Management Agency in Huntsville, AL, during which they signed an amendment to the MOU which completed the arrangements for the conduct of the program. During the ceremony, each of the NADs made official remarks that underscored the importance of the program in establishing the foundation for trans-Atlantic cooperation and for providing a model on which future cooperative efforts can be based. Excerpts from these remarks follow.

United States Perspective

The National Armament Director from the United States, Dr. Paul Kaminski, who serves as Under Secretary of Defense (Acquisition and Technology), stated, "This program is the very first of what I believe will be several cooperative programs in the arena of theater missile defense—an area that I think is at the forefront of what I would describe as the renaissance in trans-Atlantic armaments cooperation. The Medium Extended Air Defense System, or MEADS, Program is in the process really of teaming U.S., German, and Italian industry in a truly bound cooperative effort to develop a modern, deployable extended air defense system, not only for each of our countries, but I think they will turn out to be a system for many of our allies as well."

Later during his speech, Dr. Kaminski stated, "In many ways, this program is now being held up as an example of a new model in which the United States and her partners manage and execute cooperative armaments development programs. That model calls for a tighter net activity in both industry and in government—the development of teams that are operating together as true partners in the program."

Germany's Perspective

Dr. Martin Guddat, the German NAD, remarked, "This is a premiere in several respects. For the first time, a major program of the United States and European partners is carried out from the outset in cooperation on an equal footing. For the first time, such a program with United States participa-

Today, there is an increased likelihood of nations operating in a coalition environment where forces need to be deployed with equipment that is interoperable and rationalized from the standpoint of logistical support.

tion is conducted as a NATO program, that means under the legal patronage of NATO and according to NATO rules, and for the first time a NATO agency is being established on American soil."

Italy's Perspective

The Italian NAD, General Alberto Zignani, stated, "Besides the high operational value the program is aimed to, Italy looks with satisfaction to MEADS as it realizes a practical international trans-Atlantic cooperation at the industrial level. A cooperation which represents common objectives among countries which firmly advocates that NATO is indispensable and advocates the need for an increasingly stronger trans-Atlantic link." Furthermore, General Zignani stated, "A cooperation such as the MEADS project which harmonized the needs and know-how to identify the common and profitable ways to proceed for all the participating countries builds a wealth of common knowledge with vast political, economical and technological impact on the national industries. It is for this reason that we are in favor to this type of international cooperation and to all those cooperative efforts which guarantee the equal dignity of participants and where the capabilities of each nation are best used."

Principles

The official remarks by the NADs provide insight into some of the underlying principles that the nations have agreed on relative to the management and execution of trans-Atlantic cooperative programs. From the remarks, one can conclude that the model for trans-Atlantic cooperation embodies the principle of working to satisfy commonly established requirements; the principle of ensuring equal treatment among nations through the establishment of an innovative management approach and the promotion of teamwork at both the government level and industrial level; and the principle of best utilizing the capabilities of the participating nations to achieve the desired results.

Implementation Of The Principles

The establishment of common requirements is a key principle for conducting international cooperative programs. Common requirements leverage the funding contributed by the participating governments by focusing the efforts on a common technical solution instead of on a variety of national peculiar solutions. As requirements among nations become more divergent, the economics of cooperation become more difficult to justify. The approach taken in the MEADS Program was to establish a common set of international operational requirements that satisfy the needs of the participating nations in order to develop the international technical requirements document (ITRD) to serve as the technical requirements baseline for conducting the PD/V phase of the program.

The concept of equal treatment of nations is just as important to a cooperative development program as it is to any other effort where coalitions are formed and maintained. During the decision-making process, nations involved in cooperative programs must take into account both the common needs of the program and factors associated with the national interest. Any nation, in exercising its sovereign right, may allow national interests to override the common interests associated with a program. Although this circumstance is omnipresent in a cooperative program, its impact may be lessened by incorporating measures into the program that increase a nation's feeling of ownership. The feeling of ownership may be increased by ensuring each nation is treated as an equal and valued partner, regardless of financial share. In constructing the MEADS MOU, the nations have agreed to arrangements to ensure the equal treatment of each nation through the implementation of a management framework that allows each nation an equal voice in the decision process and through the implementation of a development approach that requires "meaningful work" for all participants.

New NATO Agency Established

With regard to the management approach, the PD/V MOU provides for the MEADS Program to be directed and administered on behalf of the participants (Germany, Italy and the United States) by a North Atlantic Treaty Organization (NATO) production and logistics organization that is established within the framework of NATO with the U.S. as host nation. This organization has been designated the NATO MEADS Design and Development, Production and Logistics Management Organization (NAMEADSMO) and its charter was approved by NATO on June 28, 1996. The organization consists of a steering committee and the NATO Medium Extended Air Defense System Management Agency (NAMEADSMA). The steering committee provides overall guidance and direction for the program. It's membership consists of one representative from each participating nation. Decisions of the steering committee are made unanimously.

NAMEADSMA is responsible for execut-

ing the program according to the provisions contained in the MOU, the NATO charter and according to decisions of the steering committee. Subject to the aforementioned guidelines, NAMEADSMA works on behalf of the alliance for the collective benefit of the participating nations in executing the PD/V phase of the program. In staffing the agency, positions assigned to the various nations are distributed throughout the agency to ensure representatives from all participating nations are involved in all aspects of the program.

On the industrial side, the PD/V program strategy has required two trans-Atlantic industrial entities (TAIEs) to be formed from the participating nations' industries in order to compete in demonstrating critical functions, mitigating technical issues and defining the best concept for realization of the project and subsequent selection as the single contractor to conduct both the design and development and production phases of the program. The TAIEs are comprised of industrial firms from each of the participating nations. In conducting the PD/V phase, the TAIEs were instructed based on national cost share percentages to ensure that work was shared in a 60/25/15 split among United States, German and Italian industry, respectively. In addition, the TAIEs were instructed to provide each nation with "meaningful work" and to use an integrated product development approach in conducting the effort. Based on this overall guidance, it was left to industry to determine the division of work shared among the various members of the team in order to enhance their competitive position. In response to these instructions, the TAIEs formed integrated product teams that were involved and integrated into each major product area and throughout the management team industrial members from both sides of the Atlantic. This type of arrangement provides not only a more efficient organizational approach to accomplish the system engineering and product development efforts which are so important to this phase, but it also provides the nations some measure of insight into the technical aspects spanning the entire effort from the industrial perspective.

Summary

The MEADS Program is at the forefront of a new era in trans-Atlantic cooperation. Many of the features of this program and the principles on which it is based have been described as a model for future trans-Atlantic cooperative programs. Perhaps Dr. Kaminski provided the best summary of these principles. The following are excerpts from his remarks at the MEADS Program Initiation Reception: "This project I think really is somewhat like giving birth to a new way of doing cooperative work together. It represents a new way of doing the trans-Atlantic armaments cooperation business. And I think its a model for cooperation that is now being held up by nations on both sides of the Atlantic as a model that will be much more effective in promoting cooperation between the United States and its key NATO partners." Dr. Kaminski further stated, "the three governments are true partners in many respects, but I think the close cooperation and the decision making by our Steering Committee led by Admiral Ascoli [Rear Admiral Vincenzo Ascoli of the Italian Navy and the Chairman of the MEADS Steering Committee] so ably is perhaps the most symbolic of this spirit of cooperation and unanimity. Further, I would say and underscore very strongly there are no junior partners in MEADS. We are equal partners in this program. Each nation that is a partner brings certain strengths to the program and is treated as a valued and equal partner by the fellow participants. On the industrial side, the integrated structure that both consortia have developed, I think, is one of the more unique industrial partnerships that I have seen in my career. It is an arrangement that renders almost indistinguishable the individual companies and the national origins of the participants in the program. It is really all mixed together as one. Clearly, the focus on both the government and the industry side of the program is on teamwork." In his concluding remarks, Dr. Kaminski said "I look forward to the continued success of General Meunier [BG Hunrich K. Meunier, General Manager, NAMEADSMA] and his team in making the MEADS Program a reality and a model for future trans-Atlantic armaments cooperation."

As Dr. Kaminski indicated, the success of the MEADS PD/V Phase in fulfilling the objectives of the participants will be a key ingredient in the decision to continue the MEADS Program and make deployment of the system a reality. However, an equally important ingredient will be the translation of the political "will" to continue the program into the actions required by the participating nations to make it happen. This process will require the building of advocacy at all levels of government within the participating nations to ensure that the benefits of cooperation are understood by all decision makers and that key issues are resolved in a timely manner. This type of advocacy, together with the continued success of the program in producing the desired results, will ensure that the MEADS Program will become a sound model on which future cooperative efforts can be based.

Common requirements leverage the funding contributed by the participating governments by focusing the efforts on a common technical solution instead of a variety of national peculiar solutions.

BYRON D. LAWING is the Chief, Controlling Division in the NATO Medium Extended Air Defense System Management Agency. He holds a B.S. degree in chemical engineering. He is a member of the Army Acquisition Corps and is certified Level III in program management; systems planning, research development and engineering; and business, cost estimating and financial management.

From The Director, Acquisition Career Management Office (ACMO)

Congratulations to the Competitive Development Group (CDG) selectees for 1997! The competition was stiff and we selected only 25 from more than 700 applicants. (See page 51.) We designed the CDG program to give a select group of GS-13s the opportunity to broaden their acquisition experience and hone their leadership and management skills through developmental assignments (see page 51). The selectees span many career fields and geographical areas but all are clearly the best of the best and have potential to become our future AAC leaders. On May 19-21, 1997, we will host the 1997 CDG Year Group orientation in the Washington, DC area. Be on the lookout for the announcement of the Year Group 1998 CDG competition. You don't want to miss out on a shot at this outstanding career development opportunity!

Keith Charles, Deputy Director, Acquisition Career Management, continues to visit the field to update the acquisition workforce members on career management initiatives. We plan many other visits throughout the year. I encourage you to provide feedback to us through the proponency officers and other members of this office who accompany Mr. Charles on his visits. We want to hear your ideas about career development and want to know what we can do for you. Additionally, as a result of a recent functional chief representative meeting (see summary on page 55), a process action team (PAT) is being formed to identify and address obstacles that hinder the central and operational assignments processes. We also want to find Army-wide solutions to enhance utilization after long-term training. I solicit your participation in the PAT through submission of comments and ideas.

Do you understand the importance of the Service Obligation Agreement? The Defense Acquisition Workforce Improvement Act (DAWIA) established the requirement that a person assigned to a critical acquisition position be assigned to the position for not fewer than three years. Moreover, program managers (PM) and deputy PMs of major Defense acquisition programs must be assigned until the major milestone closest to the date after the person has served for four years. Written agreements acknowledge these service obligations. Waivers of these obligations may be granted only in exceptional circumstances. Such circumstances might include: humanitarian reassignment, discharge or retirement; relief of duties and reassignment in the interest of the Department of Defense; and promotion, when promotion in place is not allowable. I remind you of your duty to honor service obligation and tenure agreements, particularly if you are selected for PM or acquisition command positions. Too many PMs and acquisition commanders are asking for waivers for voluntary retirement. We intend to deny retirement waivers unless they are for humanitarian reasons. Those officers eligible for consideration for PM/acquisition command positions who are contemplating retirement within the next three years should notify their assignment officer. Files will be withheld, without prejudice, from consideration for these selection boards. In addition, all retirement eligible officers should carefully consider their service obligation before accepting their next assignment.

Finally, on April 1, 1997, we bid a fond farewell to LaVerne Jones who retired from Government service. LaVerne's contributions have been many and the Acquisition community will miss her skillful management and selfless dedication. At the same time, we welcomed Marlu Vance, who succeeds Laverne as the Chief of the Acquisition Education and Training Division.

COL Thomas V. Rosner
Director, Acquisition Career Management Office
Pentagon, 3E427
rosnert@sarda.army.mil
(703)697-6291 (DSN 227)

Charles Visits Rock Island Arsenal

Keith Charles, Deputy Director, Acquisition Career Management (DDACM), presented a briefing to the acquisition workforce members at Rock Island Arsenal, IL, on March 4, 1997. The briefing was attended by hundreds of Army acquisition workforce members, and included sensing sessions with smaller groups to obtain feedback from the field. Charles also offered a presentation at the local chapter luncheon of the American Defense Preparedness Association (ADPA) Advance Planning Briefing to Industry (APBI). This visit was part of the Army Acquisition Corps "Roadshow," which is designed to update the acquisition workforce on current acquisition career management issues and programs. The Army Acquisition Corps exhibit, "Developing the People Who Develop the Systems," was displayed at the ADPA/APBI luncheon, along with other Army and contractor exhibits. Visits to other commands are being scheduled throughout the year.

FY 98 MAPL Review Board Convenes

The FY98 Military Acquisition Position List (MAPL) Review Board convened on Feb. 24, 1997, to review nearly 2,000 positions for inclusion on the FY98 MAPL. The board was conducted similar to a HQDA centralized board utilizing a word picture to grade each position. The voting members consisted of nine colonels of various branches representing a cross section of acquisition functional areas (51, 53, and 97) from various MACOMs, Program Executive Offices, and DOD agencies, with positions on the MAPL. The board president was an AAC brigadier general who was responsible for chairing the board and ensuring its efficient functioning. The board completed its requirements and adjourned Feb. 27, 1997.

The Acquisition Career Management Office (ACMO), in cooperation with the U.S. Total Army Personnel Command and the Deputy Chief of Staff for Personnel, will analyze and verify the results from the board and submit a suggested MAPL to the Director, Acquisition Career Management (DACM) for approval. Once the DACM approves the MAPL, it will be distributed to appropriate MAPL points of contact. Additionally, the approved MAPL will be published in a future issue *Army RD&A* magazine. PERSCOM will start assigning officers off the new MAPL upon its approval. For more information, contact MAJ Yancey Williams, ACMO, 703-697-0472.

Acquisition Education and Training Chief Retires

On April 1, 1997, more than 100 guests attended a retirement luncheon at the Fort Belvoir Officer's Club in honor of LaVerne Jones, Chief of the Army Acquisition Education and Training Office. Jones had been Chief of that office since its establishment in 1992 to implement the education and training provisions of the Defense Acquisition Workforce Improvement Act. Her retirement marks the end of 35 years of Federal service, most of which were spent in the field of Human Resource Development.

For her accomplishments on behalf of the acquisition workforce, the Deputy Under Secretary of Defense for Acquisition and Technology (DUSD(A&T)), and the Director of Acquisition Education and Training, Jones received the Defense Acquisition Executive Certificate of Achievement, signed by Hon. Paul G. Kaminski, DUSD(A&T). This plaque was presented by Jeanne Carney from the Office of the Under Secretary of Defense (Acquisition, Education and Training).

Keith Charles, Deputy Assistant Secretary for Plans, Programs, and Policy, and Deputy Director for Acquisition Career Management, presented Jones with the Superior Civilian Service Award recognizing the numerous contributions she had made to the training and career development of more than 30,000 members of the Army Acquisition Corps and workforce. Officials representing the Acquisition Education and Training Office, Office of the Secretary of Defense; Headquarters, U.S. Army Materiel Command; Headquarters, U.S. Army Corps of Engineers; and the Research, Development, and Acquisition Information Systems Activity presented Jones with various remembrances which reflected their respect for her professional abilities and her dedication to training Army civilians. Jones's commitment to excellence and her selfless concern for others will be greatly missed.

Vance Takes Over AAC Education And Training

Marlu W. Vance, former Chief, Acquisition Position and Structures Division, Army Acquisition Executive Support Agency, assumed new duties as Chief, Army Acquisition Corps Education and Training Office, Office of the Assistant Secretary of the Army for Research, Development and Acquisition (OASARDA) on April 1, 1997. Backed by more than 15 years of federal civilian service, Vance has held a variety of positions. She spent three years as a Department of Army intern in the comptroller career field with the U.S. Army Materiel Command (AMC). She managed AMC's Productivity Capital Investment program for three years, and also served with the Office of the Deputy Chief of Staff for Operations and Plans as a program analyst working Special Operations Forces issues. Vance then moved to OASARDA to manage the program executive officer structure. Vance holds a B.S. degree from the University of Alabama and an M.A. degree from the University of South Alabama. She has also completed the Program Management Course at the Defense Systems Management College, and is a member of the Army Acquisition Corps.

1997 COMPETITIVE DEVELOPMENT GROUP SELECTEES

NAME	CMD	CMD LOCATION
Doolos Catherine L	AE PEO PEO Cmd Cont Sys	FT Monmouth NJ
Griffithboyle Linda Kay	X8 CECOM	FT Monmouth NJ
Subrizi Anthony J	XM TECOM APG	APG MD
Sedlacek Carol J	X6 MICOM	Redstone Arsenal AL
Hornaday Shirley J	X6 MICOM	Redstone Arsenal AL
Gray Myra S	X6 MICOM	Redstone Arsenal AL
Longtain Robert L	AE HQ FT Belvoir FAS	FT Belvoir VA
Cope Mark W	AE PEO Tac Whl Veh	Warren MI
Pekny William M	AE PEO Aviation	St Louis MO
Scotti Ann F	SJ OSA FT Belvoir	Pentagon VA
Higginbotham Claudius L	AE PEO Tac Missiles	Redstone Arsenal AL
Weiger Rusty L	AE PEO Aviation	St Louis MO
Hopkins Alvin V	AE PEO Aviation	St Louis MO
Hansen David M	X7 TACOM APG	Picatinny Arsenal NJ
Sova Allen J	AE PEO IntelElec War	Warrenton VA
Brewer Carlton E	AE PEO Missile Def	Pentagon VA
Chiu Shu Mei (Susan)	SC SSDC	Arlington VA
Szerszynski Robert J	SF FOA FT Riley	FT Hood TX
Clark-Evans Lenora	MW USAG Ft Meade	FT Meade MD
Spisak Craig A	XB ATCOM	St Louis MO
Thompson Virginia C	CE COE Huntsville	Huntsville AL
Bruno Wayne S	AE PEO Tac Missles	Redstone Arsenal, AL
Chew Jennifer PM	XM TECOM APG	APG MD
Locke Pamela J	SB FOA OASA	Pentagon VA
Johnson James B	Info Sys Sel Acq Agy XM TECOM	APG MD

American Council On Education Evaluates DSMC Courses

The American Council on Education (ACE) evaluates formal education and training programs and courses sponsored by the Service schools, other DOD organizations, government agencies, business, and industry and makes college credit recommendations. ACE itself does not grant academic credit; it evaluates the course curriculum, recommends the amount of credit it believes a course is worthy of being granted by an accredited institution; and identifies the subject matter area in which the credit is recommended. These evaluations are published in the *ACE Guide to the Evaluation of Educational Experiences in the Armed Services,* which is published every two years. Individuals planning to use ACE credit recommendations for degree programs must have them reviewed by the institution's admissions officer. It is ultimately the decision of each college or university to accept the ACE recommendation.

ACE recommendations are of particular interest to members of the Army Acquisition Workforce, since they may be used to satisfy that portion of the Acquisition Corps education standard which requires 12 semester credit hours from among the "business" disciplines of accounting; business finance; law; contracts; purchasing; economics; industrial management; marketing; quantitative methods; and organization and management. The option to substitute equivalent training for the 12 semester credit hours in the disciplines specified was provided in Public Law 102-484, of the National Defense Authorization Act for Fiscal Year 1993. In other words, the 12 semester credit hour Acquisition Corps education standard may be met by successfully completing training courses in the specified disciplines which carry an ACE credit recommendation.

ACE has recently reviewed a number of DSMC courses. The results are reflected in the accompanying figure. Information on the recently-evaluated courses will be published in the 1998 update of the *ACE Guide to the Evaluation of Educational Experiences in the Armed Services.* Please see Appendix E of the FY97 Defense Acquisition University (DAU) catalog for ACE credit recommendations on other DAU courses.

Please contact Diane Schaule in the Acquisition Career Management Office's Acquisition Education and Training Office for information on Acquisition Corps education standards. She may be reached at Commercial (703)805-1049. Contact the DSMC Registrar's office at Commercial (703)805-2850/3666 for assistance regarding DSMC transcripts.

American Council on Education (ACE)
Recommended Credit Hours for DSMC Courses
Current Courses Offered by DSMC (See Notes 1 and 2)

DAU Course No.	Course Title	ACE Catalog DD No.	Dates Credit Valid	Undergraduate Credits	Graduate Credits	Specialty
ACQ 101	FSAMC	DD-1408-0012	9/94 - Present	3 Lower Division	N/A	Acquisition Management
ACQ 201	ISAC	DD-1408-0020	6/92 - Present	4 Upper Division	N/A	Acquisition Management
BCF 301	BCEFMW	DD-1408-0017	6/96 - Present	2 Upper Division	N/A	Financial Management
BFM 102 BFM 203	CPMFC ICPMC	DD-1408-0014 DD-1408-0015	7/95 - Present 3/96 - Present	3 Upper Division	N/A	Management (Both courses must be completed)
PMT 302	APMC	DD-1408-0018	3/95 - Present	N/A	9	3 - Financial Management 3 - Operations Management 3 - Technical Management
PMT 303	EPMC	DD-1408-0019	8/94 - Present	N/A	3	Program Management
PMT 305	PMSC	DD-1408-0021	6/96 - Present	N/A	1	Program Management
PMT 341	SACPC	DD-1408-0009	1/90 - Present	N/A	3	Procurement Management
PQM 301	APQMC	DD-1408-TBD	10/94-Present	N/A	TBD	Business Administration or Technical Management
SAM 201	ISAMC	DD-1408-0013	6/96 - Present	3 Upper Division	N/A	Acquisition Management
SYS 301	ASPRDEC	DD-1408-0016	6/96 - Present	N/A	3	Technical Management

COURSES STILL VALID FOR CREDIT BUT NO LONGER OFFERED (See notes 1, 3, 4, and 5)

PRD 301	DAEMQAC	DD-1408-0010	10/93 - 9/94	N/A	3	Business Administration or Technical Management
PMT 201	ISAC	DD-1408-0011	10/90 - 6/92	4 Upper Division	N/A	Systems Management
PMT 301	PMC	DD-1408-0007	2/90 - 3/95	2 Upper Division	9	2 - Financial Analysis/Planning 3 - Leadership/Group Decision Process 3 - Systems Management 3 - Operations Management
None	PMC	DD-1408-0002	1/73 - 1/90	6 Upper Division	9	3 - Production and Operations Management 2 - Managerial Finance 1 - General Management 9 - Program or Project Management

Notes:
(1) Shaded Courses were part of 1996 ACE Review and thus are not contained in the most recently published 1994 ACE Guide. All unshaded courses are contained in the 1994 ACE Guide. College/university admissions officers may either review the ACE Guide (for older courses) or telephonically contact ACE (for newer courses) at (202) 939-9470 for verification of credit recommendations.
(2) BFM 102 and BFM 203 must both be completed to receive credit hours
(3) PQM 301 replaced PRD 301 and is being reviewed for credit.
(4) PMT 201 was replaced by ACQ 201.
(5) PMT 301 was replaced by PMT 302.
AS OF 10 FEBRUARY 1997

Restructuring The Materiel Acquisition Management Course

The Materiel Acquisition Management (MAM) Course was established in 1984 at the request of the U.S. Army Personnel Support Command. The Army Logistics Management College was directed to create a course which would provide an overview of the entire materiel acquisition process, to teach the "language" of materiel acquisition, and to integrate the principal materiel acquisition functional disciplines. The MAM Course was designed to provide entry-level training to Army officers being assigned to positions within the U.S. Army Training and Doctrine Command, the U.S. Army Materiel Command, and the U.S. Army Operational Test and Evaluation Command. Additionally, some MAM graduates were sent to Training With Industry assignments, foreign science and technology offices, NATO Headquarters, the Pentagon, and joint commands.

During the past 13 years, our training mission has been successfully accomplished. More than 3,000 graduates have been assigned to a variety of materiel acquisition positions. These positions are primarily located in project management offices, battle labs, combat developments directorates, research and development laboratories, major subordinate commands, and test directorates. In 1993, the length of the MAM Course was reduced to eight weeks and numerous changes were made to its curriculum in order to reflect changing Department of Defense and U.S. Army materiel acquisition policies and processes coupled with funding reductions.

The rate of acquisition policy changes has accelerated during the past three years. These policy changes resulted in large numbers of procedural guides being rescinded and program documentation requirements being altered. Even milestone decision review procedures did not escape change. At the same time, funding for research and development, procurement, and training has continuously declined. These significant acquisition policy changes and continuing funding reductions were two principal reasons driving additional changes to the MAM Course.

The MAM Course proponent is the Military Deputy to the Assistant Secretary of the Army for Research, Development, and Acquisition (ASARDA), LTG Ronald V. Hite. The course proponent reviews and approves the course curriculum and length. During a Proponent Review conducted in June 1995, LTG Hite gave directions for additional changes to the MAM Course content. LTG Hite directed solicitation of input from former students, examination of ways to "trim the fat" from the course content, while retaining equivalency with the basic and intermediate acquisition courses sponsored by the Defense Acquisition University. These changes were needed in order to better reflect the realities of a rapidly evolving materiel acquisition environment which is characterized by a continuing reduction in the Department of Defense's annual training budget and a declining number of students. In 1996, LTG Hite's guidance was implemented.

Functional Area	*Hours of Coverage*
Fundamental Concepts, Structures, and Policies	45
Software Acquisition	10
Combat Developments	16
Test and Evaluation	12
Acquisition Logistics	26
Cost Estimating and Budgeting	36
Contracting	42
Production	11
Examinations	10
Total	**208**

The curriculum of today's MAM Course is shown in the accompanying figure.

Five major exercises designed to support a central materiel acquisition scenario are included in this revised curriculum. These exercises provide "hands on" application for selected major functional areas. Three of these exercises are separately graded and are used as part of the student's overall course grade.

To acknowledge the declining training dollars available, the length of the MAM Course has been further reduced to seven weeks. This reduction in course length was achieved by eliminating administrative time and formal graduation, consolidating some units of instruction, reducing the length of other units, and lengthening some class days. Reducing the total course length has not significantly impacted the coverage of materiel acquisition functional areas nor has it reduced the number of semester hours of graduate credit awarded for successful completion of the MAM Course.

In spite of reducing the course length, additional materials have been incorporated into the curriculum. Coverage of software acquisition, test and evaluation has been expanded, and risk assessment has been added. These additions to our curriculum have been accommodated by reducing the coverage of logistics and contracting subjects and requiring students to complete a majority of group exercises outside the classroom.

We must be prepared to make additional changes to the MAM Course in the future, as budget and manpower projections within the Department of Defense look bleak. Analysts predict that further cuts in funding and troop strength will be made. Thankfully, newer educational technologies are being developed which may enable continuation of a quality course at less cost.

Today, the term "distance learning" is being used to describe alternatives to classroom instruction. Distance learning encompasses a variety of media such as: printed correspondence courses, television broadcasting, video tapes, compact disks, and the Internet. There are two important questions which must be resolved before embracing distance learning as a substitute for classroom instruction. First, we must ascertain the optimum medium for employing distance learning technology with the MAM Course. For example, a portion of the MAM Course may be successfully presented on the Internet but broadcasting the entire seven-week curriculum over satellite television would not be effective. Second, we must incorporate a means of maintaining current materials. Because materiel acquisition policies and procedures will continue changing, we must retain the capability to update course materials and provide on-line assistance to students. Whether this is best done by military and civilian employees or DOD contractors is another decision. These questions will be answered as we continue the investigation into the newer educational technologies and apply for inclusion in the Advanced Concepts Technology Demonstration Program.

It may be determined that a mix of distance learning technologies coupled with some classroom instruction may result in the most cost-effective training solution for the near term. It is important that we keep an open mind to the newer edcuational technologies, maintain the emphasis on providing a quality education, while being mindful of funding realities. The MAM Course is poised to continue its evolution as the Army shapes itself to the future.

Note: The MAM Course is available to civilian members of the Army Acquisition Corps and Workforce in grades GS-9 through GS-13 who are working in a materiel acquisition assignment. Individuals who have already attended the Advanced Program Management Course (APMC) should not apply to attend the MAM Course.

The preceding article was written by Joe R. East Jr., Course Director of the Materiel Acquisition Management Course at the U.S. Army Logistics Management College.

CAREER DEVELOPMENT UPDATE

31 Graduate From MAM

Thirty-one students graduated from the Materiel Acquisition Management (MAM) Course, Class 97-002, at the U.S. Army Logistics Management College (ALMC), Fort Lee, VA. The graduates included foreign officers from Arabia, Japan and Malaysia.

Research and development, testing, contracting, requirements generation, logistics and production management are examples of the materiel acquisition work assignments being offered to these graduates.

The Distinguished Graduate award was presented to CPT Jeannette Friedland, U.S. Army Industrial Operations Command, Rock Island, IL.

The seven-week Materiel Acquisition Management Course provides a broad knowledge of the materiel acquisition function. It covers national policies and objectives that shape the acquisition process and the implementation of these policies and objectives by the U.S. Army. Areas of coverage include acquisition concepts and policies; research, development, test, and evaluation; financial and cost management; integrated logistics support; force modernization; production management; and contract management. Emphasis is placed on developing mid-level managers so that they can effectively participate in the management of the acquisition process.

PERSCOM Notes. . .

Second AAC Transfer Board Meets In June

On Aug. 30, 1996, the Army Chief of Staff approved a plan to downsize the Army Acquisition Corps (AAC). The objective of the plan is to reshape the AAC by aligning the number of officers in each year group (YG) with current requirements. The first of two U.S. Total Army Personnel Command (PERSCOM) transfer boards met last November and selected 39 officers from YG 76, 78, 82 and 83 to return to their basic branches. The second PERSCOM transfer board will convene in June 1997 to select officers in YG 79 and 80 to return to their basic branches. These officers have had either one (YG 80) or two looks (YG 79) for product manager/acquisition command.

The objective of the transfer board will be to select officers for transfer who can best serve the Army in their basic branches and will be least disadvantaged by the transfer. Criteria to be considered will include basic branch inventory requirements and an individual officer's basic branch qualifications and experience vs. his or her AAC qualifications and experience. To be considered by the transfer board, officers in YG 79 and 80 must:

- Have not previously volunteered for transfer;
- Have not been selected for AAC PM/CMD;
- Are not on the upper 1/3 of the FY 98 PM/CMD alternate list;
- Not an experimental test pilot or astronaut;
- Have declined PM/CMD after being selected.

The results of the Lieutenant Colonel Product Manager/Acquisition Command Board that met in December 1996 are expected to be released by the end of May.

Currently, YG 79 is overstrength by 45 officers and YG 80 is overstrength by 26. These numbers are declining as officers volunteer to return to their basic branches. If you are considering volunteering to return to your basic branch, contact your basic branch career manager to discuss assignment possibilities. For many officers, this is an opportunity to serve again in challenging basic branch assignments. Volunteering may also open up the opportunity to serve in geographical locations other than those offered by the AAC. There may be some advantage to officers who volunteer and begin discussing possible basic branch assignments early.

Once the resizing of the AAC is complete and Year Groups 76-83 are properly sized, we expect promotions rates for AAC officers to lieutenant colonel and colonel to return to a level at or above the Army average.

Senior Service College Slating

The following Army Acquisition Corps officers have been slated to attend Senior Service College during academic year 1997-1998:

University Of Texas

ARNONE, Robert LTC
KAURA, Mary A. LTC
MCCHESNEY, M. K. LTC

Industrial College Of The Armed Forces

ASADA, Michael LTC
BENNETT, D. B. LTC
BROUGHALL, S. LTC
CANNON, S. M. LTC
GROBMEIER, J. LTC
LEES, R. B. LTC
LINDSAY, T. C. LTC
MAJOR, E. B. LTC

Army War College

MORAN, J. R. LTC(P)
THOMAS, L. E. LTC(P)
BRAMBLETT, H. LTC
COX, M. C. LTC
DRONKA, PAUL J. LTC
GARRETT, J. L. LTC
KELLY, T. P. LTC
LESNIAK, C. F. LTC
LUDWIG, D. W. LTC
NELSON, R. J. LTC
O'REILLY, P. J. LTC
OWENS, C. D. LTC
YOUNG, B. J. LTC

DSMC's Advanced PM Course Open To Industry

The Defense Systems Management College (DSMC) has announced that vacancies for its highly acclaimed 14-week Advanced Program Management Course are open to industry executives. The course is taught at DSMC's main campus at Fort Belvoir, VA. Tuition is waived for eligible industry applicants. The next course will be Sept. 8 to Dec. 12. Contact Ruth Franklin, Registrar for the Council of Defense and Space Industry Associa-

Functional Chief Representatives Meet

An informative and successful meeting of Functional Chief Representatives was held Feb. 5, 1997, at Fort Belvoir, VA. All career fields were represented, and a valuable exchange of information took place during presentations and question and answer sessions. Following an Acquisition Career Management Office briefing, speakers from the Contracting; Engineer and Scientist; and Business, Cost Estimating and Financial Management (BCE&FM) career fields/programs offered presentations.

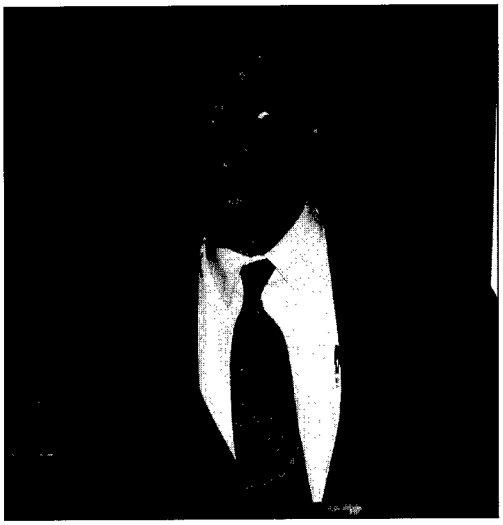
Estherlene Morse, Deputy, Defense Acquisition Regulations Council, offered the Contracting presentation, which focused on the Contracting Field's mentoring program. The emphasis in the mentoring program will be on expectations, benefits and outcome. The program was structured based on the successes of other mentoring programs as well as from lessons learned from the failure of others. Don Tucker, of the Career Program 14 (CP14) Career Management Team, offered a follow-up presentation on the CP14 Army Civilian Career Evaluation System referral system.

Joan Smith, Business Management Division, Office of the PM, Military Satellite Communications, presented the BCE&FM briefing, which highlighted the evaluation, identification of shortfalls and recommendations made for training in the BCE&FM arena. Smith recommended cross-functional training by describing her own beneficial experience taking courses in another career field.

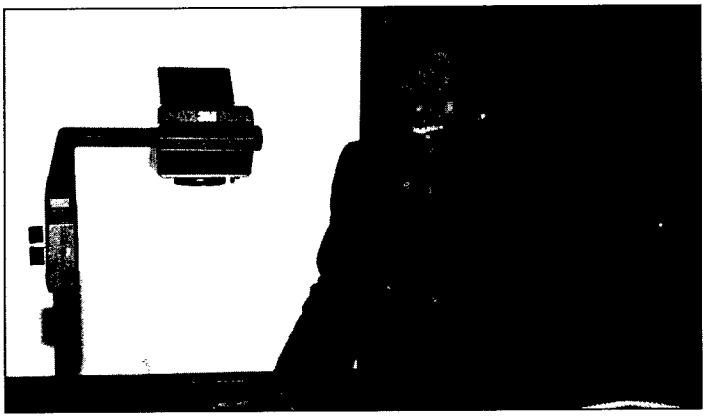
Michael Fisette, Principal Deputy for Technology, Army Materiel Command, offered a comparison of personnel statistics and census data. He spoke about the difficulties in attracting and retaining employees in the Engineering and Scientist field, and talked about outreach efforts and awards and recognition programs.

The meeting yielded a worthwhile exchange of information, and resulted in a request from Keith Charles, Deputy Director, Acquisition Career Management, that all career fields examine the basic courses offered in their areas to identify courses which offer the opportunity for employees from outside the career field to obtain a better understanding of the knowledge/expertise required to function in a position in that career field. In addition, a discussion regarding difficulties with operational assignments resulted in the decision to form an integrated process team to address the issue of post-utilization. The next meeting will be scheduled sometime after August 1997.

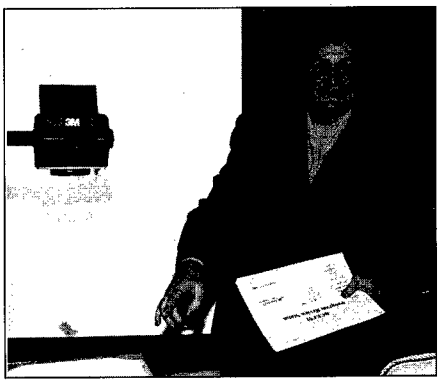
Keith Charles, Deputy Director, Acquisition Career Management.



Michael Fisette, Principal Deputy for Technology, Army Materiel Command.



Esterlene Morse, Deputy, Defense Acquisition Regulations Council.



Joan Smith, Business Management Division, Office of the PM, Military Satellite Communications.

BOOKS

A General's Insights Into Leadership And Management: Reorganizing, Consolidating, Downsizing

By Charles R. Henry, Battelle Press, 1996

Reviewed by LTC Kenneth H. Rose (USA-Ret), a project manager with the Waste Policy Institute in San Antonio, TX, and former member of the Army Acquisition Corps.

What the world needs now is not another book on leadership. Library shelves abound with a myriad of texts ranging from the philosophical ether to step-by-step, how-to checklists. Yet, every once in a while a new book comes along that seems to bridge this broad gap and say, "Look, this is how things really work." So it is with Charles R. Henry's recent offering, *A General's Insights Into Leadership And Management.*

The book has much to commend, which, regrettably, is not captured by the rather bland and limiting title. There are a lot of generals around today and they probably all have insights of one sort or another. Henry is a true champion in the arena of organization change, with a universal message and wisdom that goes far beyond reorganizing, consolidating, and downsizing. Another title might better reflect the fire that lies within, and announce up front why this book is different and should be read.

What makes this book such a welcome addition to the leadership literature lies in what it is not. While the format of personal reminisces is familiar, it is not in the mold of recently popular management megatomes that comprise an avalanche of anecdotes, overwhelming the readers with entertaining detail, but leaving them wondering what all this means to them. Instead, Henry presents principles illuminated by relevant experience, all served up in focused, digestible bites. Absent, too, are the cutesy aphorisms, long on alliteration and rhyme, but short on clarity and common sense. Henry gets right to the point.

Described as a "business general," Henry was tapped to be the first commander of the Defense Contract Management Command (DCMC) when military in-plant contract supervision activities were directed by the Deputy Secretary of Defense to be consolidated under the Defense Logistics Agency (DLA). He summarizes the creation and initial operation of DCMC in the Introduction section of the book, which provides the foundation for what follows.

Part I builds directly upon this foundation, listing seven key elements of organization change. These elements are not particularly new and Henry acknowledges this in the Preface. What is of interest is the interface between principle and practice that he presents, showing how the elements played in real world events.

As an example, under "Empowering the People," he contrasts the leadership styles of the fire-eating dragon and the benevolent leader. Clearly not an alumnus of the whip-and-spur school of leadership, he leans toward the latter. Benevolent leaders create a climate of trust and respect in which people will rise to overcome great challenge and will provide the leader with all essential information—both good news and bad—not just enough information to appease the dragon and avoid further abuse. At various places in the book he cites the Army's great logistics leaders, such as GEN Jimmy D. Ross, former Commanding General, U.S. Army Materiel Command, and LTG Donald Babers, former DLA Director, as practitioners of this style. These leaders, when confronted by crisis, would keep a cool head and work through the issue using the people of the organization as a source of solutions, not a target of rage and blame. Given the complexities, sensitivities, and fears inherent in an organization change climate, Henry touts the benevolent leadership style as the only one that will lead to a satisfactory outcome.

Henry's history also suggests that a successful change strategy includes the early application of a bold, irrevocable action that terminates current, and precludes future, political machinations. In this case, senior Pentagon leaders listened carefully to individual Service objections, then established the joint DCMC by decree, without going through the internal wrangling over how-to details that breathes life into committees and strangles innovative ideas. The details were worked out subsequently by those who would implement them and live with them. As a result, this process—aided by an unbiased group of experienced executives—was much more focused on making things work.

Parts II and III address organizational and individual leadership, respectively. Henry offers a wide variety of observations and advice—so much that the cup seems to overflow a bit. Diligent readers will soon find themselves awash in a sea of vignettes, with a fleeting sense of direction. Perhaps this book's next edition might add value by partitioning these two parts into four or five subsections organized around major leadership aspects or attributes, such as communications, ethics, or interpersonal behavior.

As they stand, Parts II and III are something of a gold mine; the prospecting reader will rediscover that gold is where you find it. The nuggets contained here include:

- *The 80-percent rule.* A leader who has grasped 80-percent of the relevant facts is ready to make an informed decision. So make one. Do something. Taking action will break the hold of Study Mania that can paralyze an organization in change.
- *Extend authority and responsibility to the lowest levels.* You will generate self-esteem, job satisfaction, and loyalty to management. As a result, people will pull together and productivity will increase.
- *In ethical matters, leaders go wrong on principles, not issues.* If you maintain solid, non-negotiable values, even at what seems at the time to be great professional cost in a specific instance, you will not find yourself on that path of incremental accommodation that ends with an unintended ethical failure.

In Part IV, Henry recapitulates his points on leadership in lists of action statements pertaining to organizational and individual leadership. The lists are long to be sure, but their action-verb format serves the reader well as both a source of explicit guidance and a memory jogger for the points previously discussed.

In whole, *A General's Insights Into Leadership and Management* is neither checklist nor philosophy. Rather, it is a resource to scan, peruse, or review as circumstances suggest. It is not a cook book or a quick fix. It is a versatile tool with unique and lasting value for those privileged to lead.

Language Converter Headed For Bosnia

U.S. Forces in Bosnia will soon have a new tool called FALCON to help them over the language barrier.

FALCON is the acronym for Forward Area Language Converter, a system consisting of a laptop computer and accompanying software that will enable a user with no foreign language training to translate foreign language documents. Developed through the joint efforts of the Army Research Lab (ARL), other military Services and federal agencies, FALCON will permit U.S. forces to translate and determine the military significance of enemy documents.

Five prototypes of the FALCON system have been sent to Bosnia for use by the Army's V Corps intelligence troops. Five others will also be built with two remaining at ARL for further testing. Two will go to the Army Special Operations Command and one will go to the 18th Airborne Corps.

"FALCON really has been the effort of a lot of different people," said Barbara Broome, Chief of the Intelligent Systems Branch of ARL's Information Sciences and Technology Directorate.

It began in 1994 through an Army Materiel Command Field Assistance in Science and Technology (AMC-FAST) initiative that outlined the need for a portable, field-operated translator to aid in the collection of intelligence, according to Dan Smith, AMC-FAST Science Advisor. The first version of the FALCON was used by the 18th Airborne Corps in Haiti and could translate French and Spanish.

T700-GE700 Engine Design of Experiments

Engine Test Cell Rework Acceptance Rate Improves

In November 1992, the T700 engine line was selected as a candidate for quality/product improvements by the Industrial Engineering Division at Corpus Christi Army Depot (CCAD), Corpus Christi, TX, because of its high test cell rejection rate of 64.5 percent, a large cycle time and a high annual internal rework cost.

At that time, a plan of action was developed to perform a comprehensive analysis of the T700 engines at CCAD.

Test Plan Developed

The overall objective of this project was to reduce the overall T700 test cell rejection rate which reduces the annual rework cost and overall cycle time. The method of approach was to identify the causes of rejection and to develop a test plan that minimizes the occurrence of these causes. To provide an initial focus, the T700-GE700 was targeted for the improvements with the assumption that the findings may be applied to the other types of T700 engines. Note, this particular engine has an overall rejection rate of 34.5 percent.

Of all discrepancies during T700-GE700 engine testing in 1992, 77 percent of the causes of rejection were due to low engine performance: 52.7 percent for low intermediate rated power (IRP), 16.2 percent high fuel flow (FF), and 8.1 percent low maximum continuous power (MCP).

Further analysis indicated the intermediate rated power was the key to correcting the engine power problems. In particular, statistical investigation revealed that high fuel flow and low maximum continuous power were present only when low intermediate rated power was encountered. Therefore, based on these findings a 16-run fraction factorial design of experiment (DOE) was developed to quantify and predict T700-GE700 engine performance measures before functional testing.

On June 21, 1993, the T700-GE700 engine testing was concluded and CCAD now has the capability of explaining at least 80 percent of the variation encountered with intermediate rated power, fuel flow, and maximum continuous power. Based on this new statistical evidence, three additional tests were designed to validate and verify regression models that were developed for each performance response. As a result of these additional tests, it was concluded that all data models for this engine were valid.

CCAD Breaks Performance Records

In particular, the first repeatability test results broke CCAD records for engine performance with an intermediate rated power rating of 209 (observed IRP - customer required IRP), a maximum continuous power rating of 317 (observed MCP - customer required MCP), and a fuel flow of -12 pound per hour (observed FF - customer required FF). Note, these findings indicated that an increase in power can be obtained while decreasing the fuel consumption for this engine.

As an outcome of this effort, a new manufacturing strategy was developed that the Directorate of Engines Production could apply to ensure that the occurrence of rejected engines due to low horsepower and high fuel consumption would be minimized during future functional testing.

Upon returning from long-term training in August 1994, the former director of Engine Production, Jose Guzman, requested evaluation of the implementation of the T700-GE700 DOE recommendations. As a result, another project was initiated to evaluate the application of DOE recommendations.

Implementation study findings revealed that seven out of eight DOE tolerance recommendations were correctly implemented at the floor. One of the DOE tolerance recommendations was used as a basis to initiate a permanent change in the T700-GE700 Depot Maintenance Work Requirement.

Improvements Sustained

Currently, engine test cell summary statistics show that the CCAD engine test cell rework acceptance rate has changed from 33 percent to 90 percent since the implementation of DOE recommendations. In addition, this improvement has been sustained for more than three-years. As a result, a cost avoidance was realized and an intangible savings in cycle time reduction of 10 days has occurred annually.

The preceding article was written by Dr. John F. Ayala, Mantech Program Manager and a senior level industrial engineer at Corpus Christi Army Depot. He recently completed his Ph.D. in engineering at Texas A&M University.

From The Acquisition Reform Office...

Army Contracting For Force XXI

A Functional Area Assessment (FAA) of the **contracting** function was conducted in response to Army leadership direction to redesign the institutional/TDA Army to effectively and efficiently perform Title 10 functions necessary to support a redesigned Army warfighting organization—Force XXI. Taskings to the Contracting FAA included the validation of savings and FTE spaces identified for the 98-03 POM, examining the feasibility of allowing only one contracting office per installation and selection of **best contracting organization** option for Force XXI. The key tasking, selection of the best contracting organization to support Force XXI, resulted in the selection of an Army-wide contracting organization based upon a MACOM "centers and satellites" approach. With concurrence of the Army Vice Chief of Staff on Oct. 30, 1996, the Army moved out with implemention of this approach. It requires all MACOMs (except the U.S.Army Corps of Engineers and the National Guard Bureau) to develop and identify their main centers and satellites for consolidation of contracting actions, and regionalize all negotiated contract actions over $500,000 at one or more "centers." MACOMs have the option of consolidating lesser value contracts as well. It is anticipated that satellite installations will retain responsibility for simplified acquisitions, credit card purchases, customer interface and contract administration functions. MACOM implementation plans for the centers and satellites approach should, at a minimum, identify the specific center(s) and satellites; the dollar threshold for the consolidation efforts; implementation milestone dates; proposed MACOM organizational structure; and plans for establishing MACOM-wide consolidated or master contracts, particularly for maintenance contracts. Acquisition organizations should also incorporate acquisition reform strategic planning as part of its implementation, identifying any regulatory obstacles that are hindering reorganization efforts.

Past Performance Information Management System February 1997

In passing the Federal Acquisition Streamlining Act (FASA), signed into law (P.L. 103-355) by the President on Oct. 13, 1994, Congress acknowledged that it is both appropriate and relevant for the a government official to consider an offeror's past performance as an indicator of the likelihood that the offeror will perform successfully on the contract the official plans to award. The Office of Federal Procurement Policy's implementation of FASA significantly expanded the number of contracts for which past performance is collected and subsequently used during the source selection process.

To respond to this challenge, the Army is developing an Internet protocol software system to assist in managing this increased volume of past performance information. The Past Performance Information Management System (PPIMS) will serve as the central repository for the Army-wide collection and utilization of contractor past performance information. Only authorized personnel will have access to the contractor past performance evaluations in the PPIMS database. The PPIMS uses a user identification and password system to authenticate users and control access. The contractor performance evaluations contained in the PPIMS are considered "Source Selection Information" and will be protected from disclosure to unauthorized persons and protected to ensure data availability, integrity, and confidentiality. The PPIMS is for use by government personnel only. Upon request, a contractor may obtain a copy of all evaluations being retained on his organization.

Contractor evaluations will be prepared on an interim basis and at time of contract completion on all contracts over $1 million. Upon completion of the evaluation, to include any contractor rebuttals, validation of the rating, and contracting officer approval, the data will be posted to the database and available for use in the source selection process.The original hard copy with hand-written signatures will be retained by the cognizant contracting official in the local contract file. Past performance data will be retained for three years after contract close-out to provide source selection information to support future award decisions.

The PPIMS will be available to begin data input in late Spring 1997. Contracting offices will be granted initial access to PPIMS incrementally through a 10-week period. For additional information regarding the PPIMS, contact Thomas Colangelo in the Procurement Initiatives Directorate, SARD-PI, at (703)681-7558.

Army Still Charging Ahead. . .

First DOD Activity Converts Cardholder Accounts To New Software And Implements Certifying Officer Legislation

Being first is nothing new for the Army. The Army continues to be the single largest user of the International Merchant Purchase Authorization Card (IMPAC) in the federal government, in numbers of sales, transactions and cardholders. Now, the Army is leading the way in implementing other approved recommendations of the DOD Acquisition and Financial Management Purchase Card Integrated Process Team, which presented results of its report to the Under Secretary of Defense (Comptroller) and the Deputy Under Secretary of Defense (Acquisition Reform) in June 1996. The report made numerous recommendations to improve and streamline the current purchase card program and several of those recommendations included maximizing automation and streamlining the reconciliation, accounting and bill paying processes.

In order to implement many of the changes, OSD sought to have the current bank, through GSA, make changes to

their IMPAC software platform. As an alternate, the bank offered to convert current DOD cardholder accounts from the Rocky Mountain BankCard System (RMBCS) IMPAC data platform to a new corporate payment system (CPS) data platform. The new software platform, CPS, is operated by RMBCS's parent, First Bank System, and is used by their commercial customers. The CPS is more flexible and will allow for better/easier cardholder maintenance and report generation for the local Agency Program Coordinators (APCs). The new software will also allow carryovers of unpaid balances at the cardholder level and will allow the bill to be invoiced to the approving official—both initiatives identified as necessary to streamline the reconciliation and bill paying process. Most cardholder information will be automatically "rolled over" or transferred to the new platform but some maintenance on cardholder accounts may have to be accomplished. New cards will be issued, however, the issuance will be conducted in a way that a valid card will always be available to existing cardholders. The bank will train and qualify all agency program coordinators on the use of the automated tools of the software (FirstLink and FirstView).

Concurrent with the software conversion, the bank will invoice to and the Army will certify for payment by the approving official. The certification for payment will implement recent Certifying Officer Legislation as detailed in the Under Secretary of Defense (Comptroller) memorandum of Oct. 17, 1996, subject; Purchase Card Reengineering Implementation Memorandum #1: Certifying Officer Guidance. Approving officials will now be authorized to "certify for payment" cardholder monthly statements of accounts. This will allow DFAS to disburse payments without additional reconciliation and certification responsibilities.

Finally, and concurrent with the above conversion, the Army will implement the Military District of Washington's "Checkbook System" as its automated cardholder reconciliation program. This program will replace the current manual log-keeping requirement placed on the cardholders and assign a single line of accounting for each card. Two electronic interfaces are being developed for the program; the Defense Finance and Accounting Service (DFAS) is creating an electronic interface between the cardholder reconciliation software and the supporting accounting system, and the Defense Manpower Data Center is developing an interface between the reconciliation system and the bank. While the reconciliation programs are available now, the interfaces should be developed and available within the year.

In addition to increasing the savings with the card's use and making the process more responsive to the cardholders, these three initiatives will result in collateral savings from a reduction in the workload performed by DFAS. As the Army initiates bulk funding, uses a single line of accounting for each card, and assumes certification authority, OSD has promised a significant reduction in DFAS charges.

The Army piloted the new software conversion at four of their installations during February 1997, and will transfer all cardholder accounts (40,000+) by the end of June 1997.

Installations Benefit From Javits-Wagner-O'Day Act Stores

The Javits-Wagner-O'Day (JWOD) Program is a mandatory source program enacted under Public Law 92-28 and implemented at FAR PART 8. Under the Program, the federal government obtains supplies and services from nonprofit agencies employing persons who are legally blind or have other severe disabilities. The central nonprofit agencies are National Industries for the Blind (NIB) and National Industries for the Severely Handicapped. They, in turn, authorize buys directly from their participating agencies (i.e. Lions Clubs Industries, Lighthouse for the Blind).

A wide range of products are made by these agencies, such as sewn products and writing instruments, and are marketed under the Skilcraft trade name. Services that are available from these agencies include the operation of Self Service Supply Centers (SSSCs) and food service at installations.

In the wake of wholesale closures of SSSCs at Army installations, customers for the supplies previously available from SSSCs, had to shop downtown or order and wait for delivery of supplies from the General Services Administration. In order to respond to the supply problems caused by the SSSC closure at Fort Bragg, the Commander entered into an agreement with Lions Clubs Industries, to operate a store on the installation. It stocks a mix of items from GSA sources, NIB-produced items, and commercially supplied products. Examples of stocked items include office supplies, calendars, batteries, cleaning supplies, locks, tools. Items not stocked, would be obtained rapidly. Payment is made by the government IMPAC card. The success of that mutually beneficial arrangement has been followed with agreements between NIB agencies and Forts Campbell, Drum, Stewart, McClellan and several others are currently being negotiated. Benefits reported by Installation Directors of Logistics and Contracting include the following:

Immediate fulfillment of supply needs; Reduced paperwork; Large selection of authorized items; Opportunity to view items purchased; Support for contingency operations within hours of notification; Savings on the cost of items; Liberal return policy; Government manpower not used; Eliminates travel to town to obtain supplies; Recycles items, i.e. toner cartridges; and Fulfills requirements of the JWOD Program.

What A Difference A SPEC Makes

Use of a performance specification and reliance on commercial products to satisfy its requirement for the M22 Binocular, the U.S. Army Tank-automotive and Armaments Command—Armament and Chemical Acquisition and Logistics Activity (TACOM-ACALA) will avoid costs of more than a half million dollars over the life of the contract. The application of acquisition reform principles to this procurement allowed the IPT to make common sense decisions to streamline requirements, adopt commercial packaging and quality assurance methods and implement an effective Best Value competition which considered bid samples, limited technical proposals, past performance and price. **BOTTOM LINE:** Reduced unit cost **and** reduced administration/production lead time.

For additional information on this article, contact LTC L. Hooks on (703)681-9479 or e-mail: hooksl@sarda.army.mil.

***Army RD&A* is now available on the worldwide web at:**
http://dacm.sarda.army.mil/publications/rda

LETTERS

Sir:

I am writing in response to COL Rosner's comments on page 50 in the January-February 1997 issue of *Army RD&A* regarding sending AAC officers to the Army Management Staff College vice Command and General Staff College (CGSC).

I have found that the CGSC experience gained from 10 months with fellow Army officers studying tactics, combat support, intelligence, corps and division offense and defense, plus many other Army subjects, as well as the general give and take of the study groups, could not have been more valuable over the past several years. If the premise of having a uniformed acquisition corps is to bring the experience and knowledge of operational assignments to bear on program management, procurement, R&D, and contracting, then clearly the advantage is with CGSC. Additionally, the CGSC curriculum offers several electives that could support AAC enhanced training, such as Total Quality Management, Emerging Technologies, Organizational Behavior, and Automation. Finally, the Prairie Warrior exercise at the end of the course is valuable to see the various battlefield operating systems and 1000 students from the Army, Navy, USAF, USMC and allies working together on one common project integrating nearly a year's worth of study.

Fortunately, I was given the chance for an operational assignment to Korea from 1991-93 as a functional area 53B. Many AAC majors and lieutenant colonels left the field Army as captains and except for the CGSC assignment haven't had a chance to use a grease pencil and do intelligence preparation of the battlefield for 10 or more years. A fair percentage of the fellow CGSC students will be future battalion commanders, i.e., customers of our products. Leavenworth gives a common experience between the PM and the receiver that just wouldn't happen at AMSC.

With some PM offices staffed up to five percent government (military and government civilian) and 95 percent contractor support, the operational bridge and credibility has to come from the uniformed officers' experience, particularly for combat systems. That experience cannot help but be further developed by attending CGSC.

LTC John Burke
AAC
burkejd@hqda.army.mil

PERSONNEL

Echols Joins The Acquisition Career Management Office

The Acquisition Career Management Office (ACMO) welcomes Tony Echols to our staff. He is the ACMO Proponent for logistics, quality assurance, and manufacturing and production. Echols will also serve as the interface between the Acquisition Career Management Advocates and Acquisition Workforce Support Specialists in the field and the Deputy Director for Acquisition Career Management. Echols's most recent assignment was with the Program Executive Office, Armored Systems Modernization (ASM) where he was a senior logistics officer responsible for Integrated Logistics Support across the ASM fleet.

Echols has a B.S. degree in mathematics and an M.B.A. degree from the Florida Institute of Technology. In addition to his assignment in the ACMO, Echols serves as Combined Arms Service Staff School Staff Leader in the U.S. Army Reserves.

NEW PHONE NUMBERS FOR *ARMY RD&A* MAGAZINE

The *Army RD&A* magazine editorial office has changed its phone numbers. Effective immediately, our new phone numbers are:

Harvey Bleicher, Editor-in-Chief	(703)805-1035
Melody Barrett, Managing Editor	(703)805-1036
Debbie Fischer, Assistant Editor	(703)805-1038

The DSN prefix, 655, remains the same, as does our fax number, (703)805-4218 or DSN 655-4218.

ARMY RD&A WRITER'S GUIDELINES

About Army RD&A

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Purpose

To instruct members of the RD&A community relative to RD&A processes, procedures, techniques and management philosophy and to disseminate other information pertinent to the professional development of the RD&A community.

Subject Matter

Subjects of articles may include, but are not restricted to, policy guidance, program accomplishments, state-of-the-art technology/systems developments, career development information, and management philosophy/techniques. Acronyms should be kept to a minimum and, when used, be defined on first reference. Articles with footnotes are not accepted.

Length of Articles

Articles should be approximately 1,500 t o 1,600 words in length. This equates to approximately 8 double-spaced typed pages, using a 20-line page.

Photos and Illustrations

Include any photographs or illustrations which complement the article. Black and white is preferred, but color is acceptable. Graphics may be submitted in paper format, or on a 3 1/2-inch disk in powerpoint, but must be black and white only, with no shading, screens or tints. We cannot promise to use all photos or illustrations, and they are normally not returned unless requested.

Biographical Sketch

Include a short biographical sketch of the author/s. This should include the author's educational background and current position.

Clearance

All articles must be cleared by the author's security/OPSEC office and public affairs office prior to submission. The cover letter accompanying the article must state that these clearances have been obtained and that the article has command approval for open publication.

Submission Dates

Issue	*Author's Deadline*
January-February	15 October
March-April	15 December
May-June	15 February
July-August	15 April
September-October	15 June
November-December	15 August

Authors should include their address and office phone number (DSN and commercial) with all submissions, **as well as a typed, self-adhesive label containing their correct mailing address**. In addition to providing a printed copy, authors should submit articles on a 3 1/2-inch disk in MS Word, or ASCII format. Articles may also be sent via e-mail to: bleicheh@aim.belvoir.army.mil


FORCE XXI